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CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-8494/14-01-08-C

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-00

Testing laboratory

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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

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Manufacturer

Neratec Solutions AG
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8608 Bubikon / SWITZERLAND

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE - LAN) Devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**WLAN module**
Model name:	**DT60M**
FCC ID:	**2AEJD-103678-DT60M**
IC:	**9301A-103678DT60M**
Frequency:	U-NII band 5725-5850 MHz
Technology tested:	WLAN
Antenna:	External antennas
Power supply:	3.30 V DC by external power supply
Temperature range:	-30°C to +70°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

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Andreas Luckenbill
Lab Manager
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1 Table of contents

2 General information

2.1 Notes and disclaimer

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This test report replaces the test report with the number 1-8494/14-01-08-B and dated 2015-07-13

2.2 Application details

Date of receipt of order:	2014-09-16
Date of receipt of test item:	2015-01-26
Start of test:	2015-01-26
End of test:	2015-03-06
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE - LAN) Devices

3.1 Measurement guidance

KDB 789033 D02	v01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E
KDB 662911 D01	v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature:	T_{nom}	+22 °C	during room temperature tests
	T_{max}	+70 °C	during high temperature tests
	T_{min}	-30 °C	during low temperature tests
Relative humidity content:		42 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	3.30 V	DC by external power supply
	V_{max}	3.60 V	
	V_{min}	3.15 V	

5 Test item

Kind of test item	:	WLAN module
Type identification	:	DT60M
PMN	:	DT60M
HVIN	:	DT60M
FVIN	:	6.4.4 RC1
HMN	:	-/-
S/N serial number	:	103678-A-03-000097, 103678-A-03-000098, 103678-A-03-000099
HW hardware status	:	V3
SW software status	:	6.4.4 RC1
Frequency band	:	U-NII band 5725-5850 MHz
Type of radio transmission **Use of frequency spectrum**	: :	OFDM
Type of modulation	:	BPSK, QPSK, 16 – QAM, 64 – QAM
Antenna	:	External antennas
Power supply	:	3.30 V DC by external power supply
Temperature range	:	-30°C to +70°C

5.1 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-8494/14-01-01_AnnexA
1-8494/14-01-01_AnnexB
1-8494/14-01-01_AnnexD

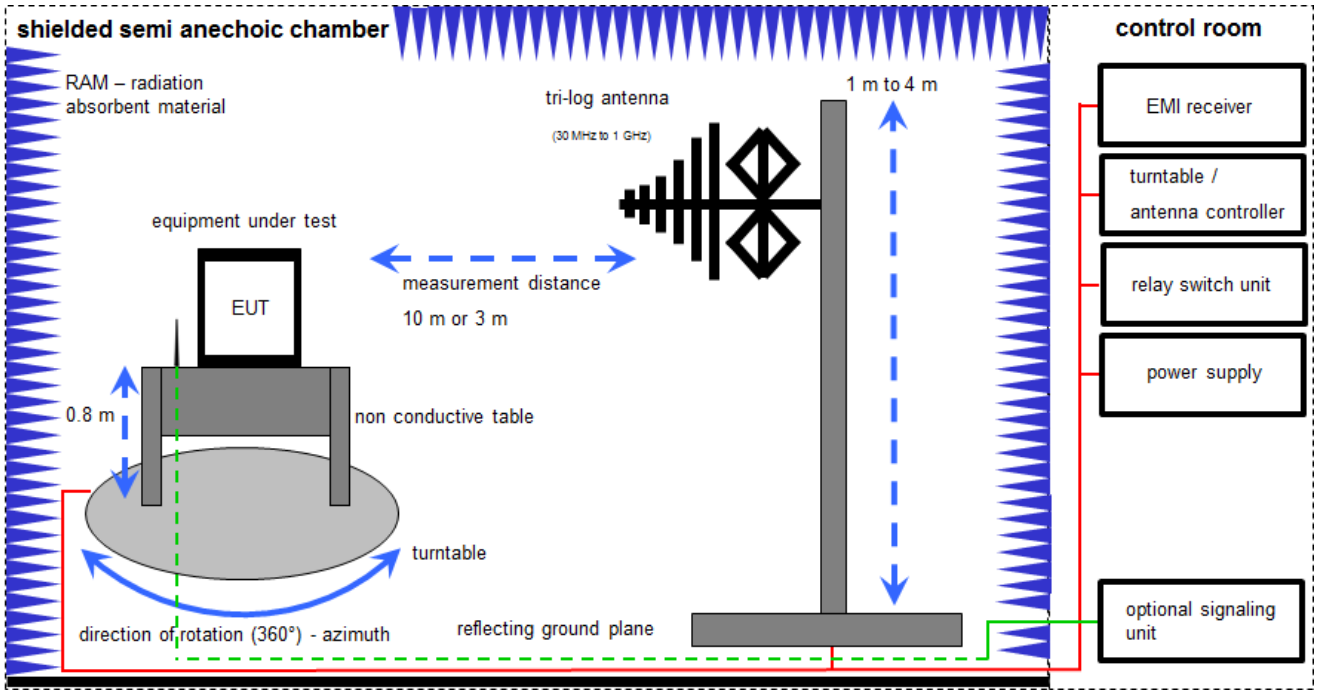
6 Test laboratories sub-contracted

None

7 Description of the test setup

7.1 Radiated measurements chamber F

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.4. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.4 and ANSI C63.10.



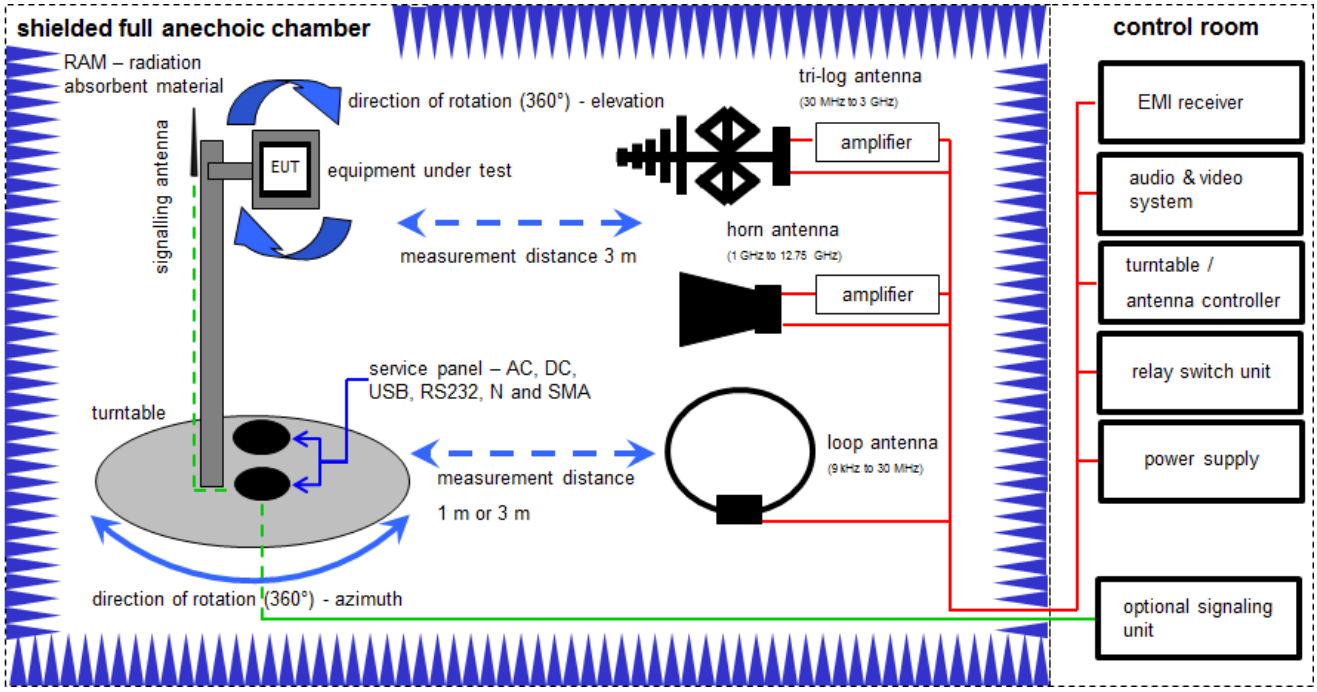
$SS = U_R + CL + AF$
(SS-signal strength; U_R-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:
SS [dBµV/m] = 12.35 [dBµV/m] + 1.90 [dB] + 16.80 [dBµV/m] = 31.05 [dBµV/m] (35.69 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
3	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	30.01.2014	30.01.2016
4	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	29.01.2015	29.01.2017
5	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	26.08.2014	26.08.2016
6	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016

7.2 Radiated measurements chamber C



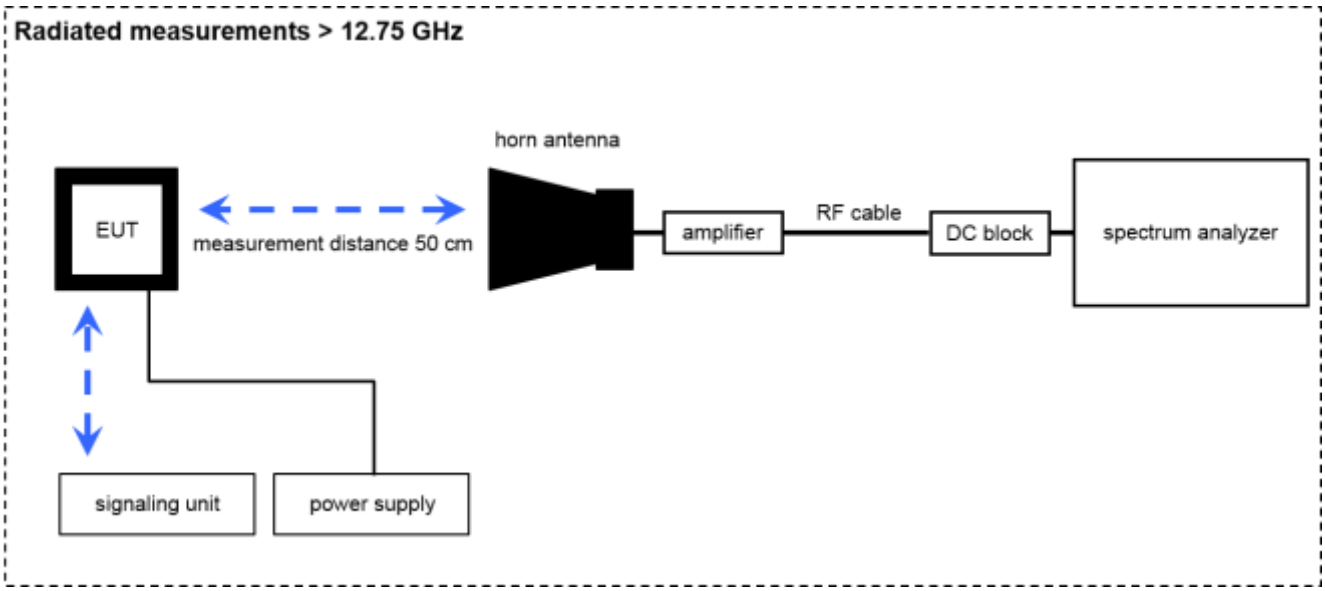
SS = U_R + CA + AF
(SS-signal strength; U_R-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
SS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dBµV/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A,C	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	23.07.2013	23.07.2015
2	A,B	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	22.01.2015	22.01.2016
3	A,C	Highpass Filter	WHK1.1/15G-10SS	Wainwright	37	400000148	ne	22.04.2014	22.04.2017
4	A	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne	-/-	-/-
5	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	318	300003696	k	22.04.2014	22.04.2017
6	A,C	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22050	300004482	ev	-/-	-/-
7	A	Broadband Amplifier	CBLU5135235	CERNEX	22011	300004492	ev	-/-	-/-
8	A,C	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
9	A,B,C	Messrechner und Monitor	Intel Core i3 3220/3,3 GHz, Prozessor	Agilent Technologies	2V2403033A5421	300004591	ne	-/-	-/-
10	A,B,C	NEXIO EMV-Software	BAT EMC	EMCO	2V2403033A5421	300004682	ne	-/-	-/-
11	B	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	24.06.2015	24.06.2017

7.3 Radiated measurements 12.75 GHz to 26 GHz



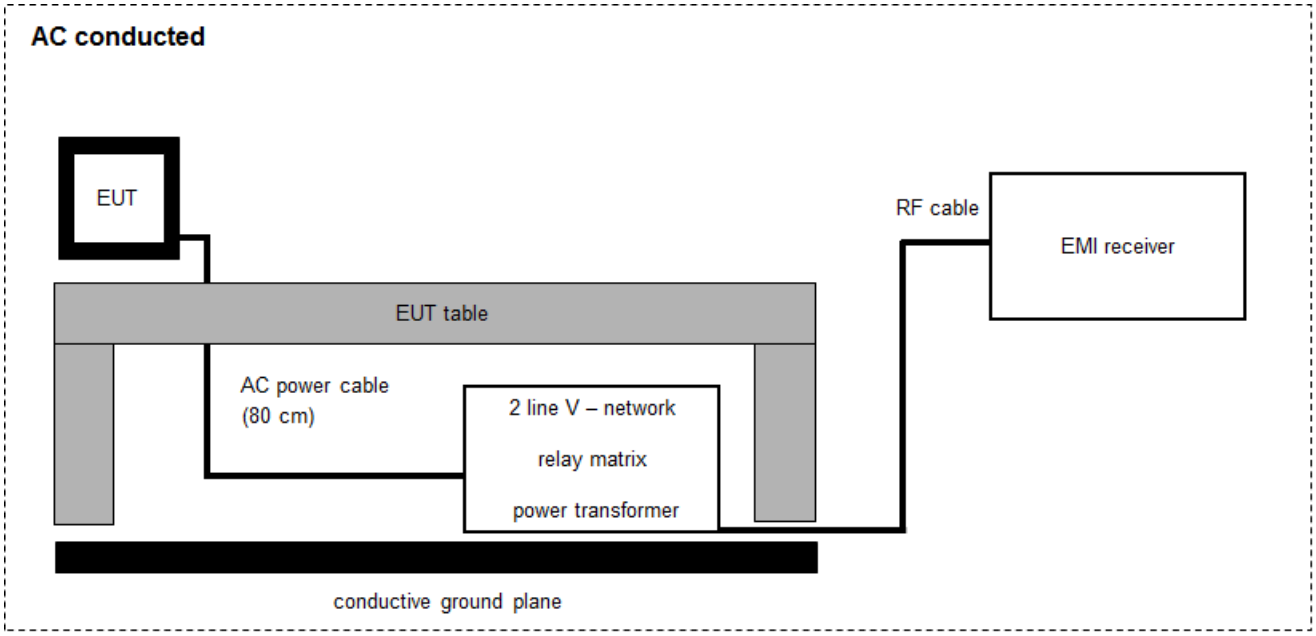
SS = U_R + CA + AF
(SS-signal strength; U_R-voltage at the receiver; CA-loss signal path & distance correction; AF-antenna factor)

Example calculation:
SS [dBµV/m] = 40.0 [dBµV/m] + (-60.1) [dB] + 36.74 [dBµV/m] = 16.64 [dBµV/m] (6.79 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
2	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
4	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
7	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 127377	400001185	ev	-/-	-/-

7.4 AC conducted



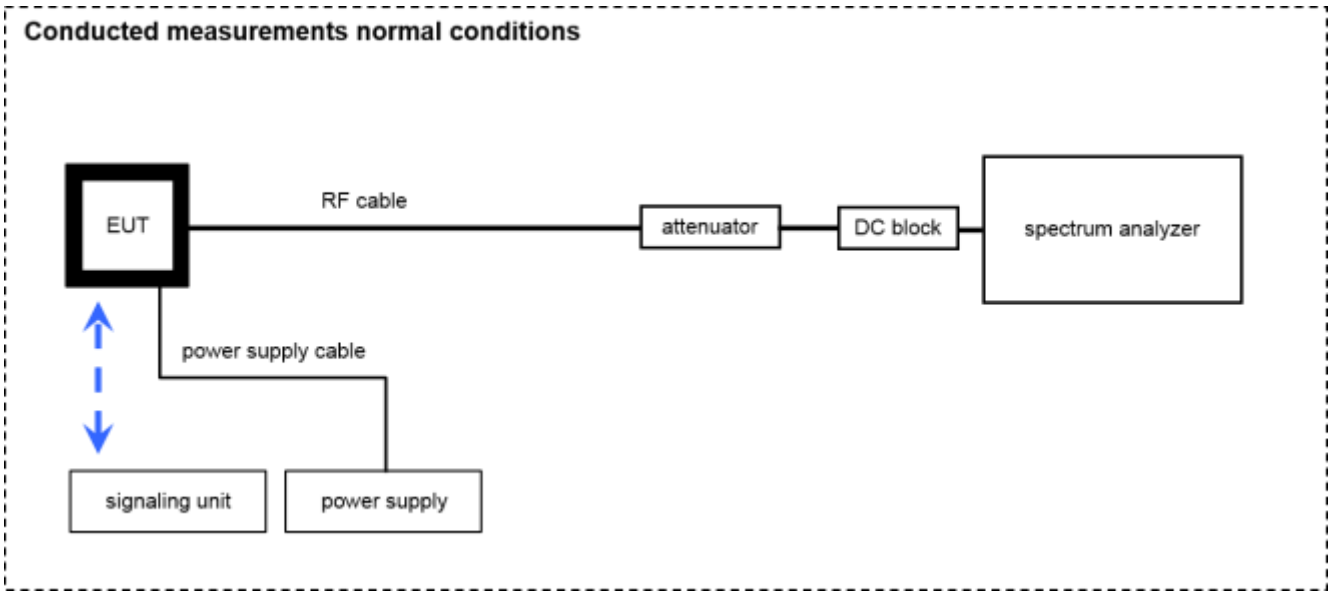
SS = UR + CF + VC
(SS-signal strength; UR-voltage at the receiver; CR-loss of the cable and filter; VC-correction factor of the ISN)

Example calculation:
SS [dBµV/m] = 37.62 [dBµV/m] + 9.90 [dB] + 0.23 [dB] = 47.75 [dBµV/m] (244.06 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Netznachbildung	ESH3-Z5	R&S	892475/017	300002209	k	17.06.2014	17.06.2016
2	A	RF-Filter-section	85420E	HP	3427A00162	300002214	k	27.11.2006	-/-
3	A	EMI-Receiver	8542E	HP	3617A00170	300000568	k	28.01.2015	28.01.2016

7.5 Conducted measurements



OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + (11.7) [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
2	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
3	A	Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562	vlKl!	10.01.2013	10.01.2016
4	A	PC-WLAN Tester	Intel Core i3 3220/3,3 GHz, Prozessor	Agilent Technologies	2V2403033A4523	300004589	ne	-/-	-/-
5	A	Teststand	Teststand Custom Sequence Editor	National Instruments GmbH	2V2403033A4523	300004590	ne	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001181	ev	-/-	-/-
7	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	Batch no. 127377	400001185	ev	-/-	-/-
8	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits	Batch no. 127377	400001186	ev	-/-	-/-

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
Antenna gain	± 3 dB
Power spectral density	± 1.5 dB
Spectrum bandwidth	± 100 kHz (depends on the used RBW)
Occupied bandwidth	± 100 kHz (depends on the used RBW)
Maximum output power	± 1.5 dB
Peak excursion measurements	± 1.5 dB
Minimum emissions bandwidth	± 100 kHz (depends on the used RBW)
Spurious emissions conducted	± 3 dB
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB

9 Sequence of testing

9.1 Sequence of testing 9 kHz to 30 MHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axces (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK (QPK / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

9.2 Sequence of testing 30 MHz to 1 GHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 10 or 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions

Final measurement

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP (Quasi-Peak / see ANSI C 63.4) detector with an EMI receiver
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

9.3 Sequence of testing 1 GHz to 12.75 GHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement

- The final measurement will be performed with minimum the six highest peaks according the requirements of the ANSI C63.4.
- According to the maximum found antenna polarisation and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarisations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

9.4 Sequence of testing above 12.75 GHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 0.5 meter
- The EUT was set into operation.

Premeasurement

- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

10 Summary of measurement results

☐	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS 247 Issue 1	see table	2015-07-27	TR without DFS

Test specification clause	Test case	Temperature conditions	Power source voltages	C	NC	NA	NP	Remark
-/-	Output power verification (conducted)	Nominal	Nominal	☐	☐	☐	☐	-/-
-/-	Gain	Nominal	Nominal	☐	☐	☐	☐	-/-
U-NII Part 15	Duty cycle	Nominal	Nominal	☐	☐	☐	☐	-/-
§15.407(a) RSS - 247 (6.2.1) (1) RSS - 247 (6.2.2) (1) RSS - 247 (6.2.3) (1) RSS - 247 (6.2.4) (1)	Maximum output power (conducted & radiated)	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(a) RSS - 247 (6.2.1) (1) RSS - 247 (6.2.2) (1) RSS - 247 (6.2.3) (1) RSS - 247 (6.2.4) (1)	Power spectral density	Nominal	Nominal	☒	☐	☐	☐	-/-
RSS - 247 (6.2.4)	Spectrum bandwidth 6dB bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(a)	Spectrum bandwidth 26dB bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
RSS Gen clause 6.6	Spectrum bandwidth 99% bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.205 RSS - 247 (6.2.1) (2) RSS - 247 (6.2.2) (2) RSS - 247 (6.2.3) (2) RSS - 247 (6.2.4) (2)	Band edge compliance radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407(b) RSS - 247 (6.2.1) (2) RSS - 247 (6.2.2) (2) RSS - 247 (6.2.3) (2) RSS - 247 (6.2.4) (2)	TX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.109 RSS-Gen	RX spurious emissions radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.209(a) RSS-Gen	Spurious emissions radiated < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.107(a) §15.207	Spurious emissions conducted emissions < 30 MHz	Nominal	Nominal	☒	☐	☐	☐	-/-
§15.407 RSS - 247 (6.3)	DFS	Nominal	Nominal	☐	☐	☐	☒	not a part of this TR

Note: NA = Not Applicable; NP = Not Performed; C = Complaint; NC = Not complaint

11 Additional comments

Reference documents: Parrot_ANT_2_IPEX_On_Sensefly_dipol_dual_band_low_gain.pdf

Special test descriptions:

Power settings parrot antenna (5dBi)

	Mode:			
	a		nHT-20	
Channel:	SISO	MIMO	SISO	MIMO
5745 MHz	19	16	19	16
5785 MHz	18	15	18	15
5805 MHz	18	15	18	15
5825 MHz	17	14	17	14

	Mode:	
	nHT-40	
Channel:	SISO	MIMO
5755 MHz	18	15
5815 MHz	18	15

Configuration descriptions: None

Test mode: ☐ No test mode available.

☒ Special software is used.
EUT is transmitting pseudo random data by itself

12 Measurement results

12.1 Identify worst case data rate

Measurement:

All modes of the module will be measured with an average power meter to identify the maximum transmission power on low, mid and high channel. In the case that only one or two channels are available, only these will be measured.

In further tests only the identified worst case modulation scheme or bandwidth will be measured.
Additional the band edge compliance test will be performed in the lowest and highest modulation scheme.

Measurement parameters:

Average Power Meter

Results:

Modulation	Modulation scheme / bandwidth	
Frequency	5745 MHz	5825 MHz
OFDM / a – mode	6 Mbit/s	6 Mbit/s
OFDM / n/ac – mode HT20	MCS0	MCS0
Frequency	5755 MHz	5815 MHz
OFDM / n/ac – mode HT40	MCS0	MCS0

12.2 Gain

Description:

Antenna gain declaration of the manufacturer.

Limits:

Antenna Gain
Maximum 6 dBi

The manufacturer declared a maximum gain of 5 dBi over the frequency band of 5725 MHz to 5850 MHz.

EUT supports 2x2 MIMO over MMCS connectors.

12.3 Duty cycle

Description:

The duty cycle is necessary to compute the maximum power during an actual transmission. The shown plots and values are to show an example of the measurement procedure. The real value is measured direct during the power measurement or power density measurement. The correction value is shown in each plot of these measurements.

Measurement:

Measurement parameter	
According to: KDB789033 D02, B.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	10 MHz
Video bandwidth:	10 MHz
Span:	Zero
Trace-Mode:	Video trigger / view / single sweep
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

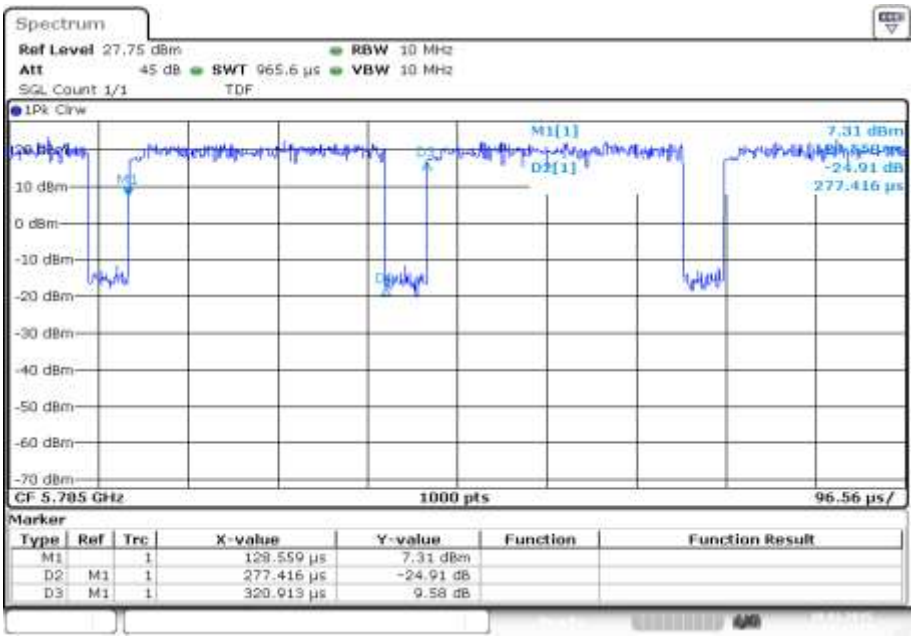
Example for one channel:

Duty cycle and correction factor:

OFDM / a – mode:	86.45 % duty cycle	=>	0.63 dB
OFDM / n – mode HT20:	87.05 % duty cycle	=>	0.60 dB
OFDM / n – mode HT40:	99.70 % duty cycle	=>	0.01 dB

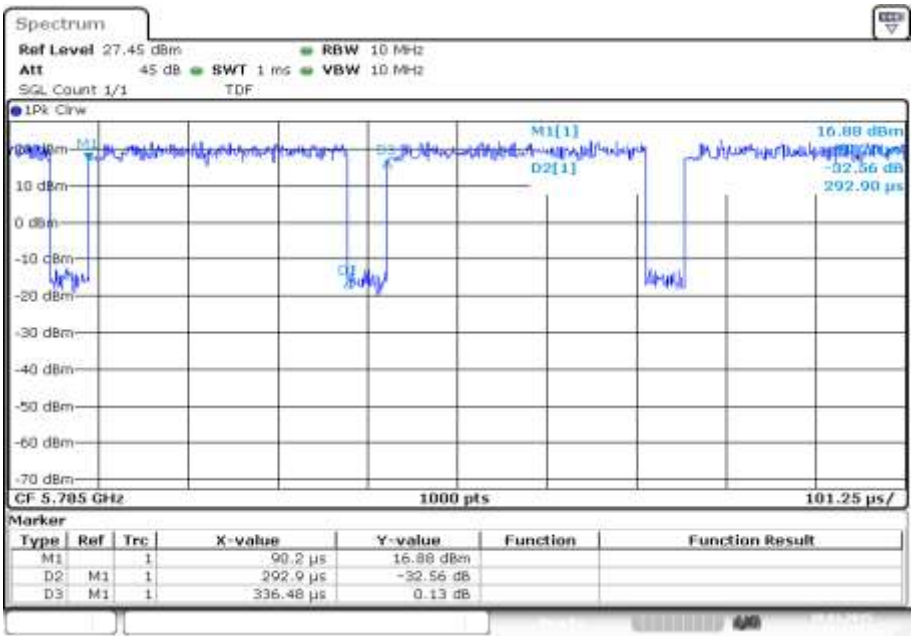
Plots:

Plot 1: duty cycle of the transmitter – OFDM / a – mode



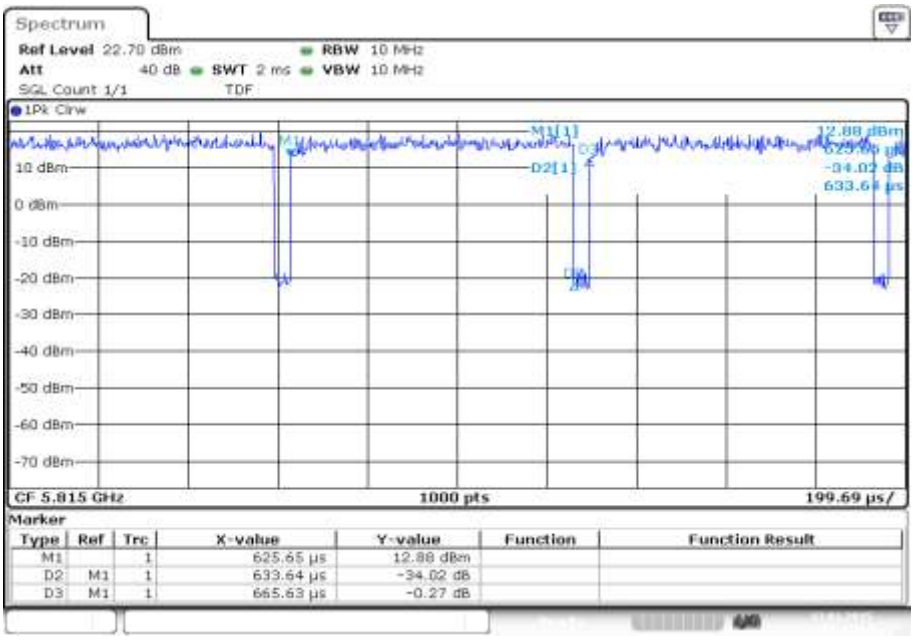
Date: 10.MAR.2015 14:35:30

Plot 2: duty cycle of the transmitter – OFDM / n – mode HT20



Date: 10.MAR.2015 16:24:02

Plot 3: duty cycle of the transmitter – OFDM / n – mode HT40



Date: 13.MAR.2015 10:01:04

12.4 Maximum output power conducted

Description:

Measurement of the maximum output power conduced

Measurement:

Measurement parameter	
According to: KDB789033 D02, E.2.e.	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ 3 MHz
Span:	> EBW
Trace-Mode:	Max hold
Analyzer function	Band power / channel power Interval > 26 dB EBW
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

Limits:

Radiated output power	Conducted output power
Conducted power + 6dBi antenna gain	250mW 5.150-5.250 GHz (FCC) The lesser one of 200 mW or 10 dBm + 10 log Bandwidth 5.150-5.250 GHz (IC) 250mW or 11 dBm + 10 log Bandwidth 5.250-5.350 GHz 250mW or 11 dBm + 10 log Bandwidth 5.470-5.725 GHz 1W or 17 dBm + 10 log Bandwidth 5.725-5.825 GHz (IC) (where Bandwidth is the 26dB Bandwidth [MHz]) 1W 5.725-5.85 GHz (FCC)

Result: OFDM / a – mode single antenna mode

OFDM / a – mode	Maximum output power conducted [dBm]				
Channel	5745 MHz	5785 MHz	5805 MHz	5825 MHz	-/-
incl. duty cycle correction	17.5	17.0	16.5	15.6	-/-

Verdict: Complies

Result: OFDM / a – mode dual antenna mode

OFDM / a – mode	Maximum output power conducted [dBm]				
Channel	5745 MHz	5785 MHz	5805 MHz	5825 MHz	-/-
ANT 1	15.2	14.2	13.6	12.7	-/-
ANT 2	14.6	13.6	13.5	12.5	-/-
Sum power:	17.9	16.9	16.6	15.6	-/-

Verdict: Complies

Result: OFDM / n – mode HT20 single antenna mode

OFDM / n – mode HT20	Maximum output power conducted [dBm]			
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
incl. duty cycle correction	17.5	16.9	15.3	-/-

Verdict: Complies

Result: OFDM / n – mode HT20 dual antenna mode

OFDM / n – mode HT20	Maximum output power conducted [dBm]			
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
ANT 1	14.8	14.1	12.4	-/-
ANT 2	14.7	13.5	12.8	-/-
Sum power:	17.8	16.8	15.6	-/-

Verdict: Complies

Result: OFDM / n – mode HT40 single antenna mode

OFDM / n – mode HT40	Maximum output power conducted [dBm]	
Channel	5755 MHz	5815 MHz
incl. duty cycle correction	16.3	16.5

Verdict: Complies

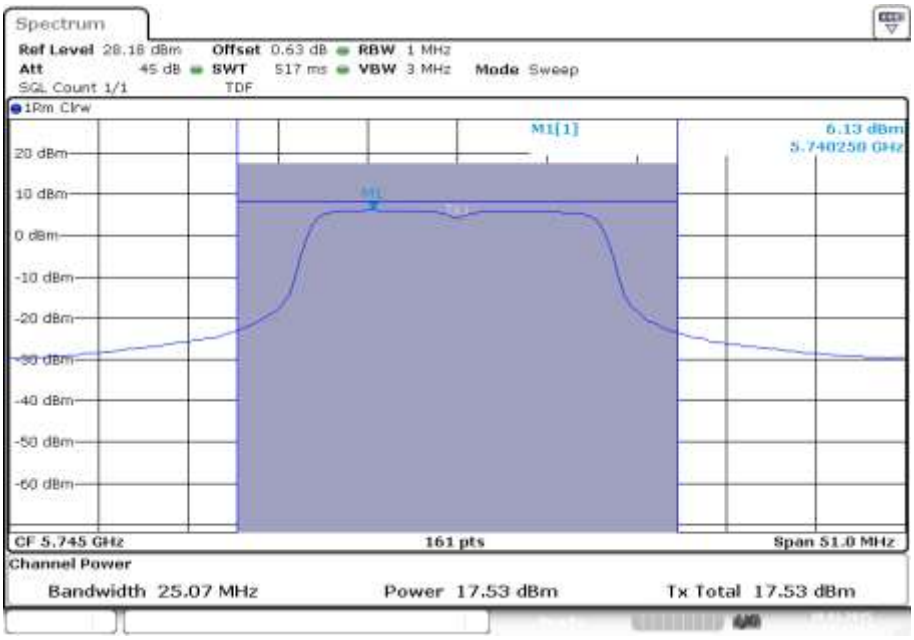
Result: OFDM / n – mode HT40 dual antenna mode

OFDM / n – mode HT40	Maximum output power conducted [dBm]	
Channel	5755 MHz	5815 MHz
ANT 1	13.8	14.1
ANT 2	13.5	13.2
Sum power:	16.7	16.7

Verdict: Complies

Plots:

Plot 1: OFDM/a-mode, single antenna, antenna 1, 5745 MHz



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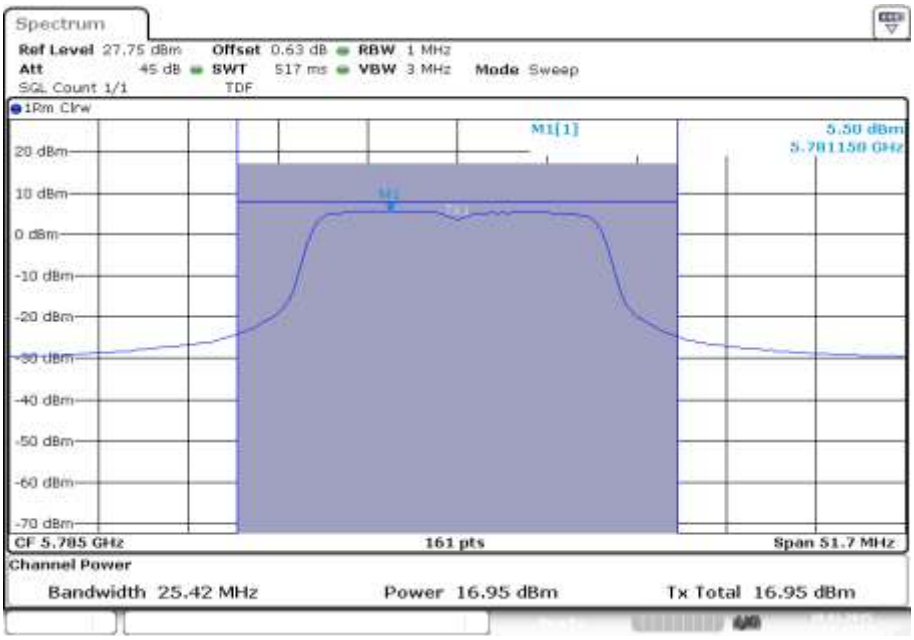
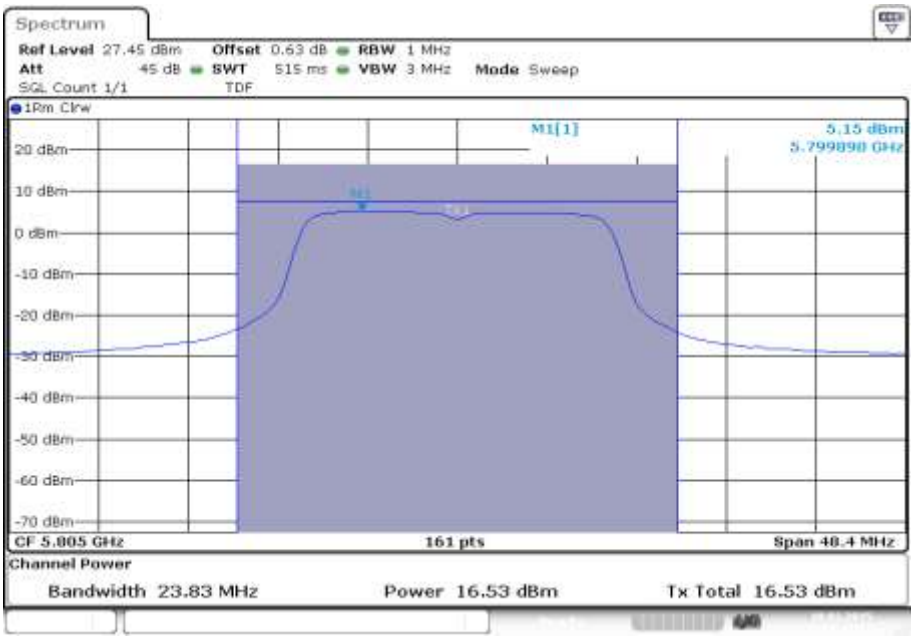
Plot 2: OFDM/a-mode, single antenna, antenna 1, 5785 MHz



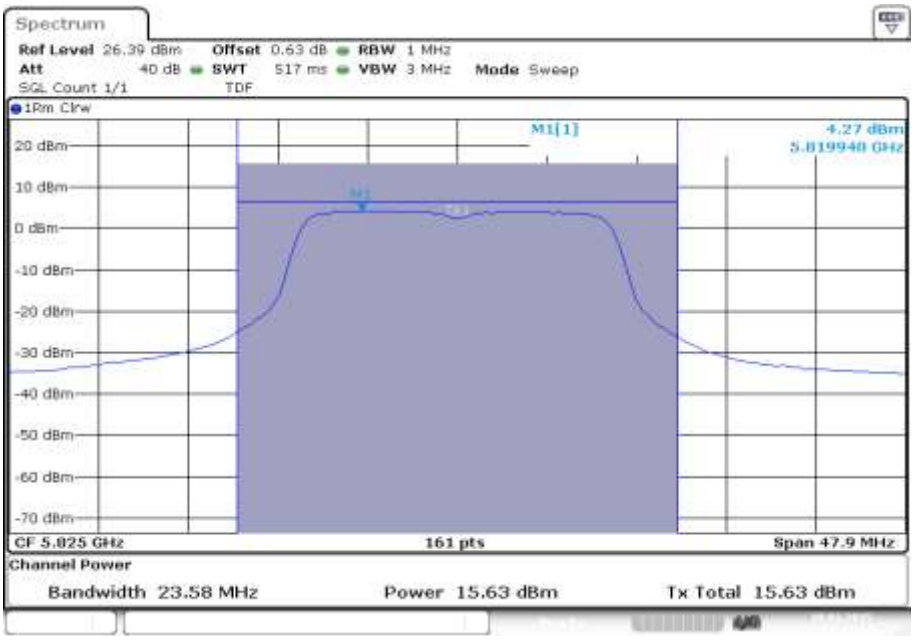
Date: 10.MAR.2015 14:36:04

Plot 3: OFDM/a-mode, single antenna, antenna 1, 5805 MHz



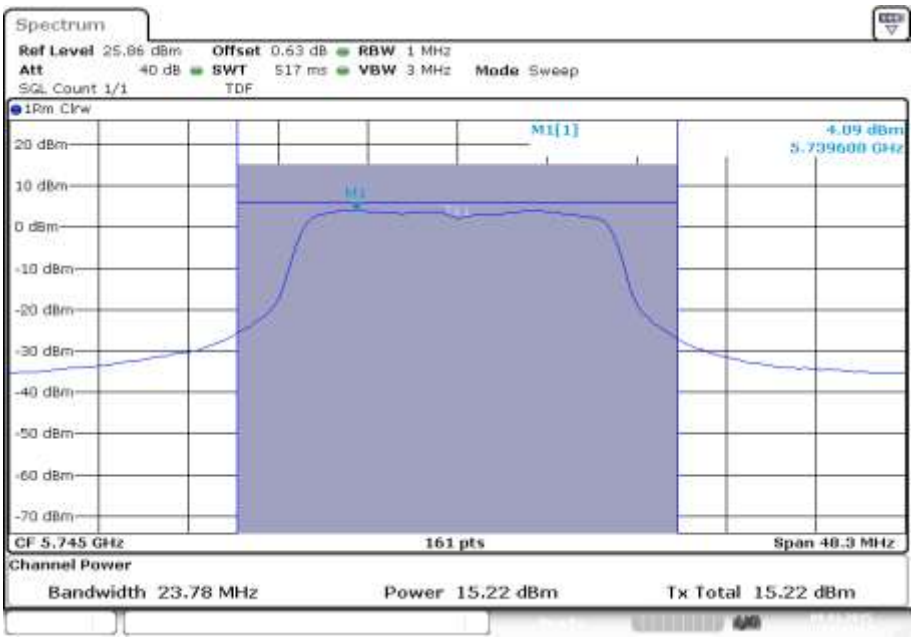
Date: 10.MAR.2015 14:39:12

Plot 4: OFDM/a-mode, single antenna, antenna 1, 5825 MHz



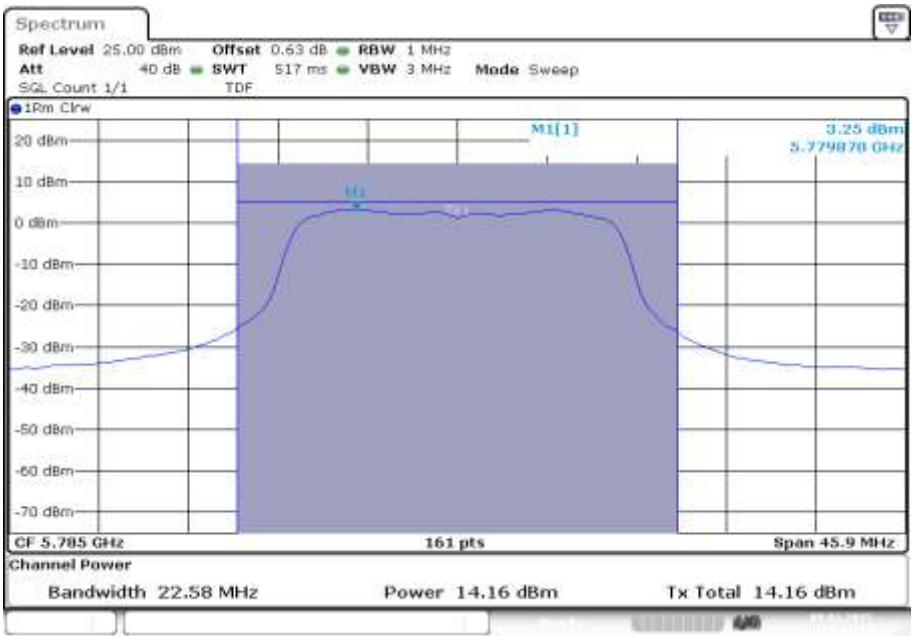
Date: 10.MAR.2015 14:51:44

Plot 5: OFDM/a-mode, multi antenna, antenna 1, 5745 MHz



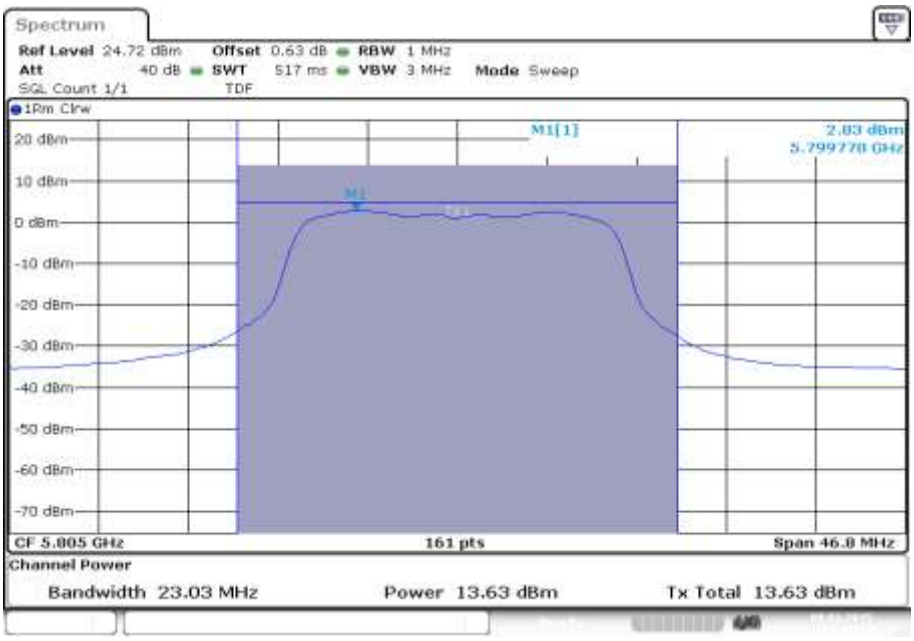
Date: 9.MAR.2015 10:08:42

Plot 6: OFDM/a-mode, multi antenna, antenna 1, 5785 MHz



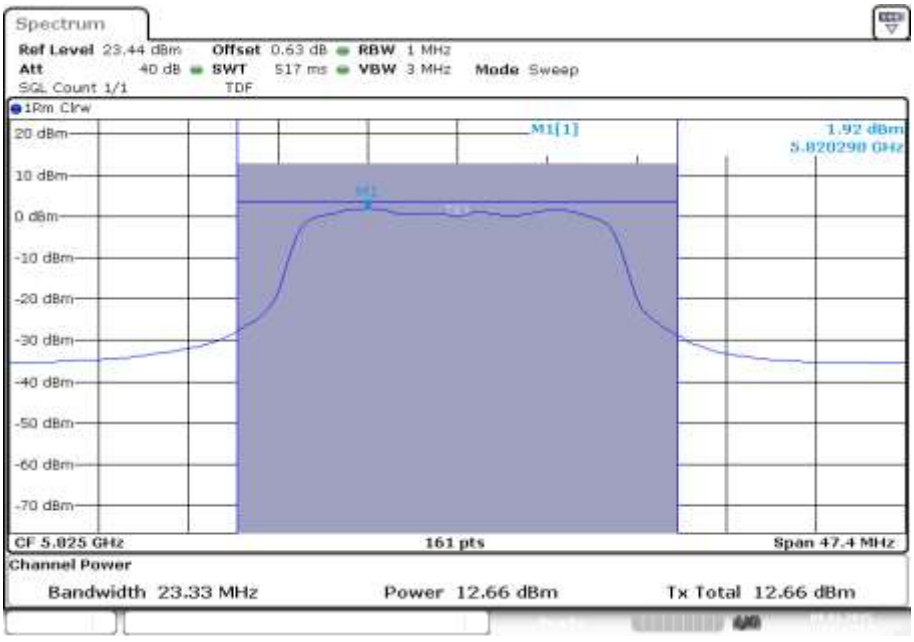
Date: 9.MAR.2015 10:11:06

Plot 7: OFDM/a-mode, multi antenna, antenna 1, 5805 MHz



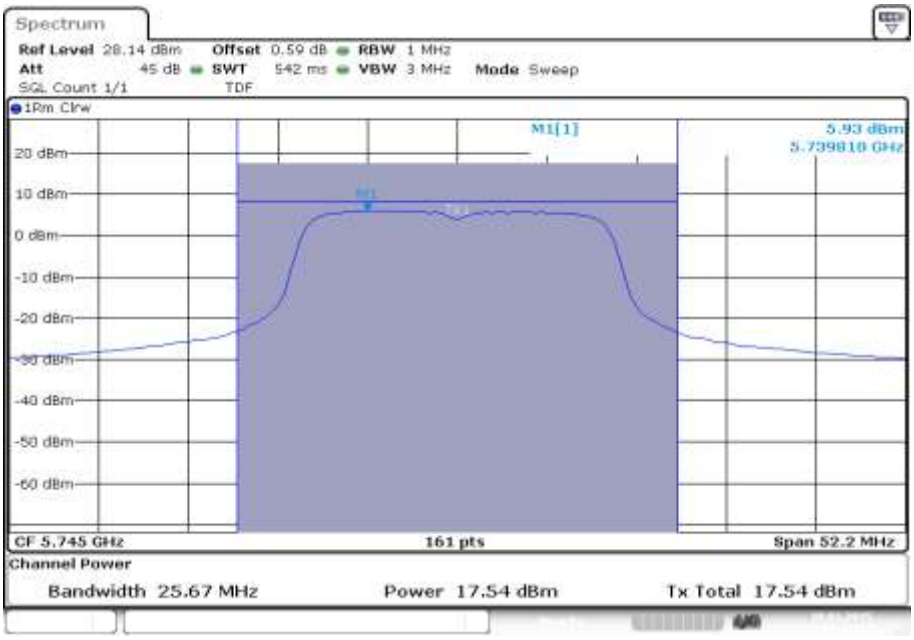
Date: 9.MAR.2015 10:13:19

Plot 8: OFDM/a-mode, multi antenna, antenna 1, 5825 MHz



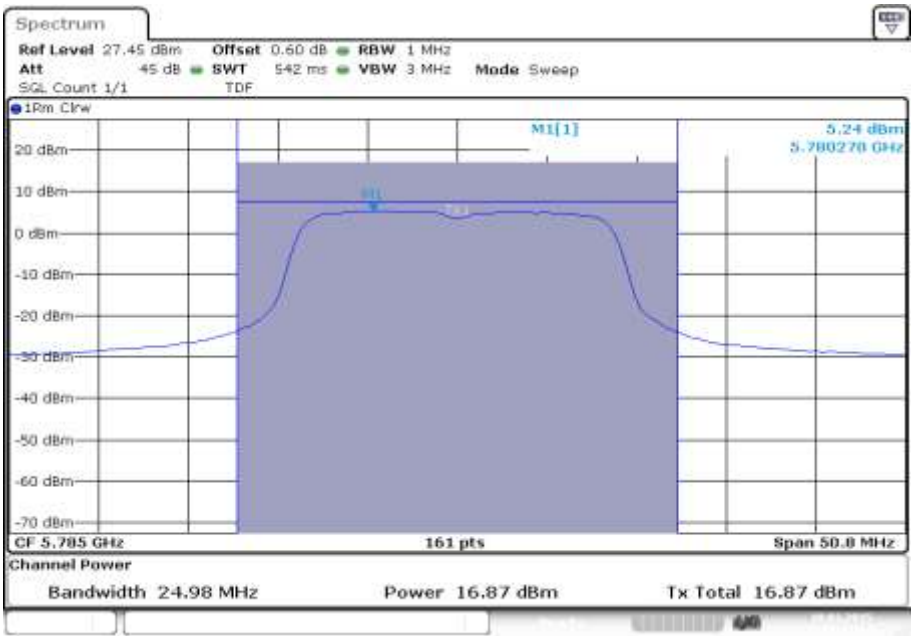
Date: 9.MAR.2015 10:17:32

Plot 9: OFDM/n-mode, single antenna, antenna 1, 5745 MHz



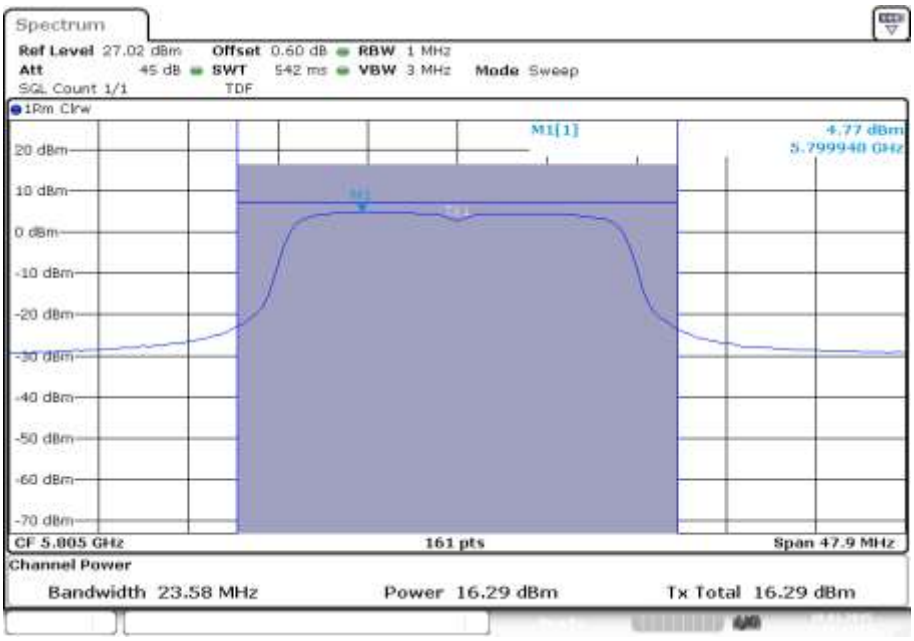
Date: 10.MAR.2015 16:20:03

Plot 10: OFDM/n-mode, single antenna, antenna 1, 5785 MHz



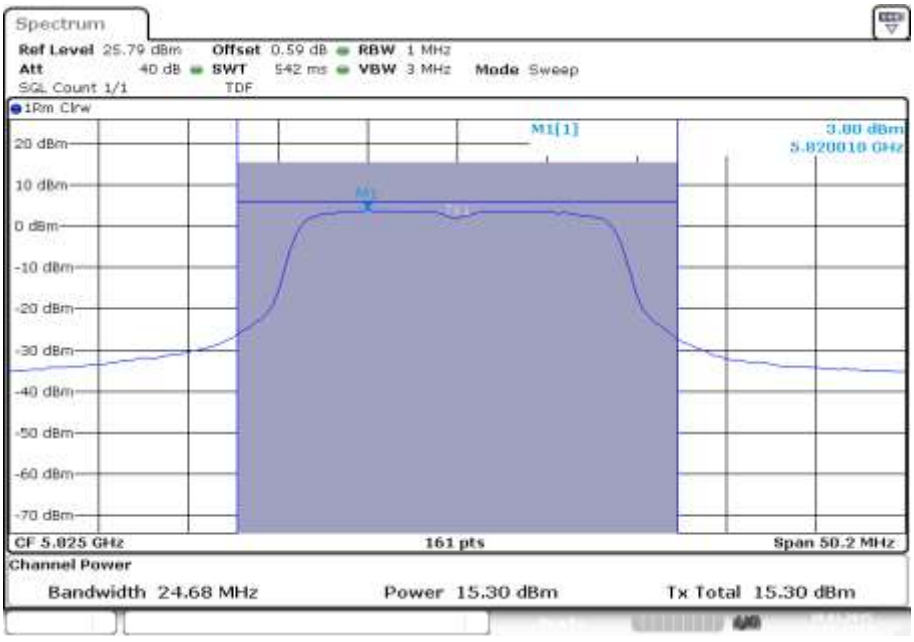
Date: 10.MAR.2015 16:24:35

Plot 11: OFDM/n-mode, single antenna, antenna 1, 5805 MHz



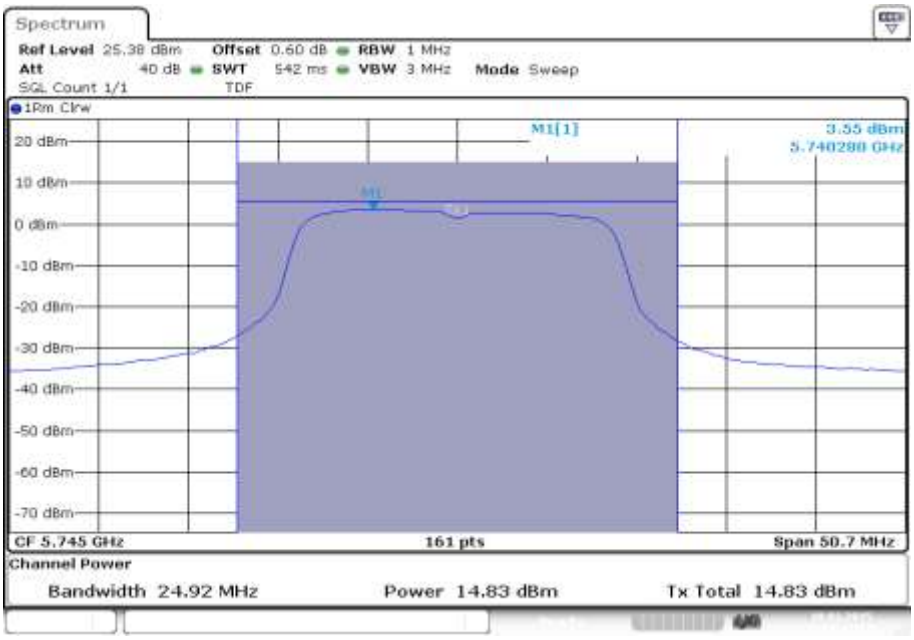
Date: 10.MAR.2015 16:27:16

Plot 12: OFDM/n-mode, single antenna, antenna 1, 5825 MHz



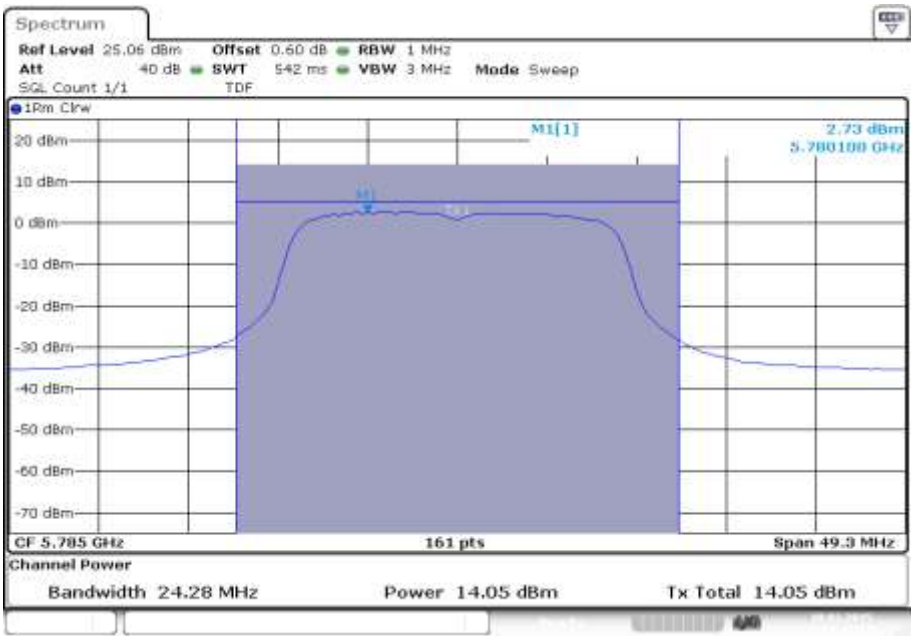
Date: 10.MAR.2015 16:29:09

Plot 13: OFDM/n-mode, multi antenna, antenna 1, 5745 MHz



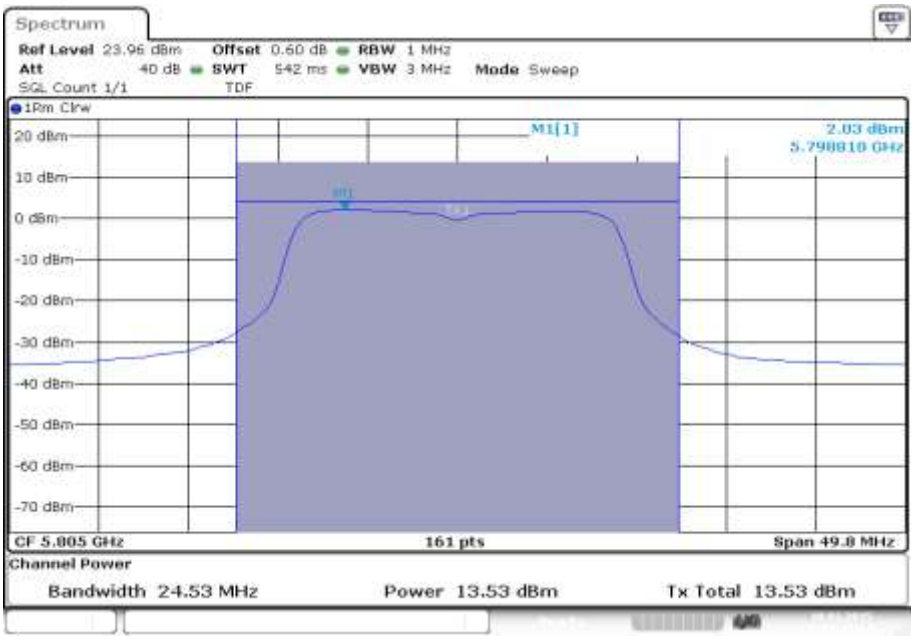
Date: 10.MAR.2015 11:17:01

Plot 14: OFDM/n-mode, multi antenna, antenna 1, 5785 MHz



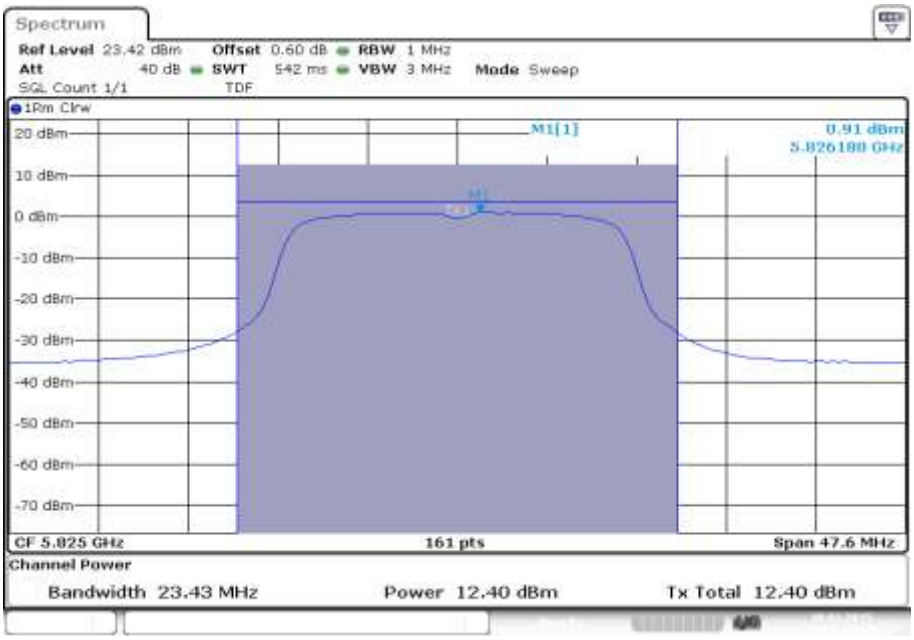
Date: 10.MAR.2015 11:34:59

Plot 15: OFDM/n-mode, multi antenna, antenna 1, 5805 MHz



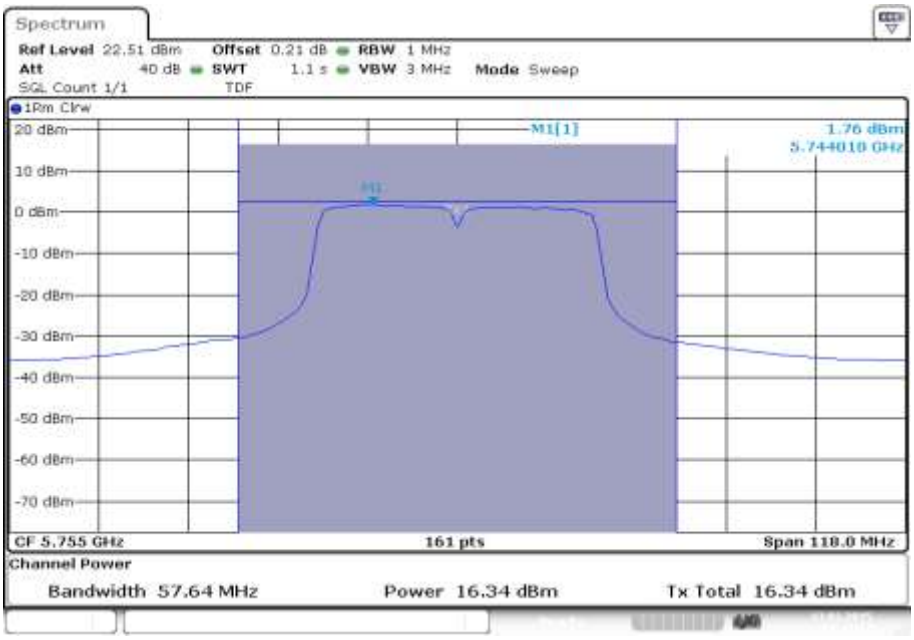
Date: 10.MAR.2015 11:40:15

Plot 16: OFDM/n-mode, multi antenna, antenna 1, 5825 MHz



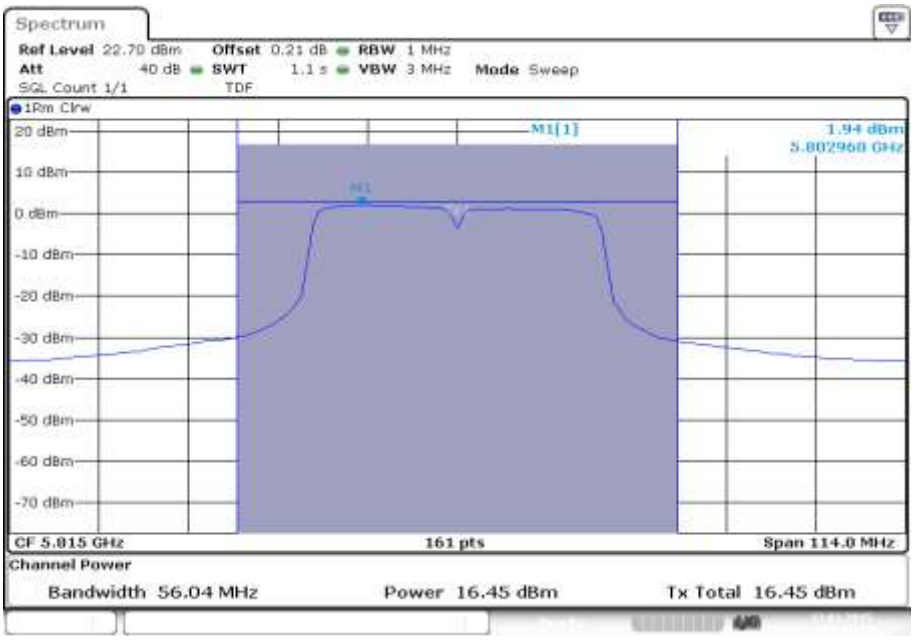
Date: 10.MAR.2015 11:44:49

Plot 17: OFDM/n40-mode, single antenna, antenna 1, 5755 MHz



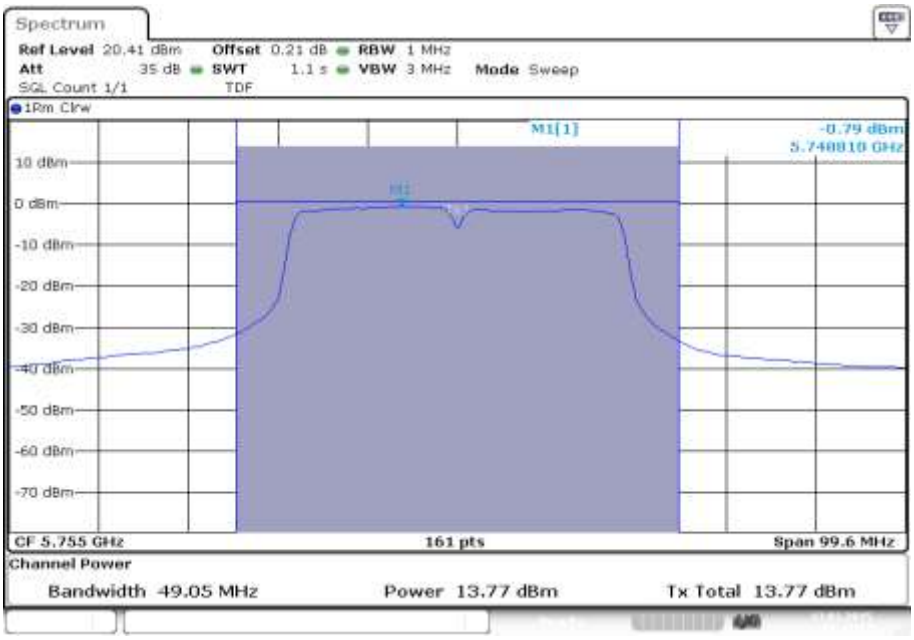
Date: 13.MAR.2015 08:30:12

Plot 18: OFDM/n40-mode, single antenna, antenna 1, 5815 MHz



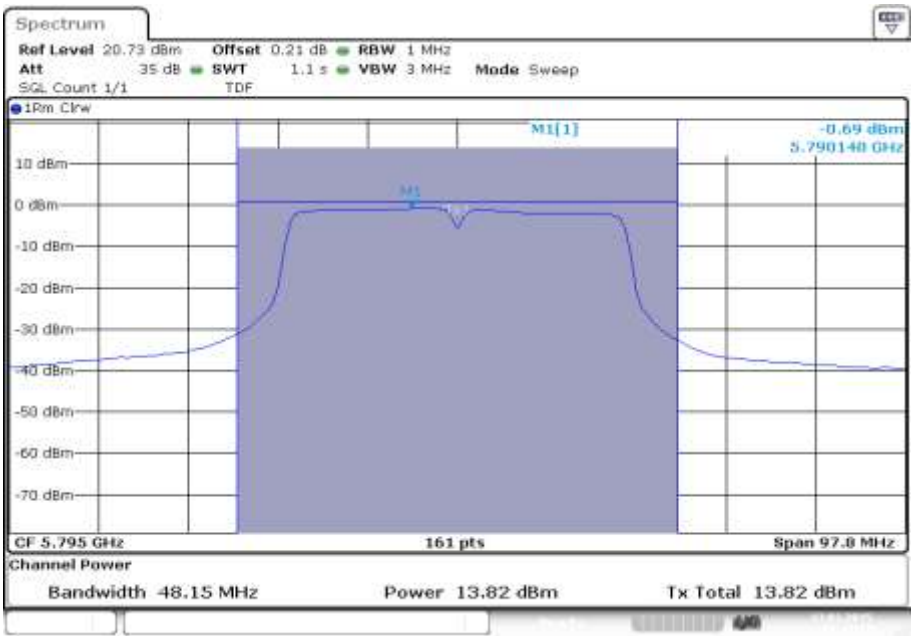
Date: 13.MAR.2015 10:01:20

Plot 19: OFDM/n40-mode, multi antenna, antenna 1, 5755 MHz



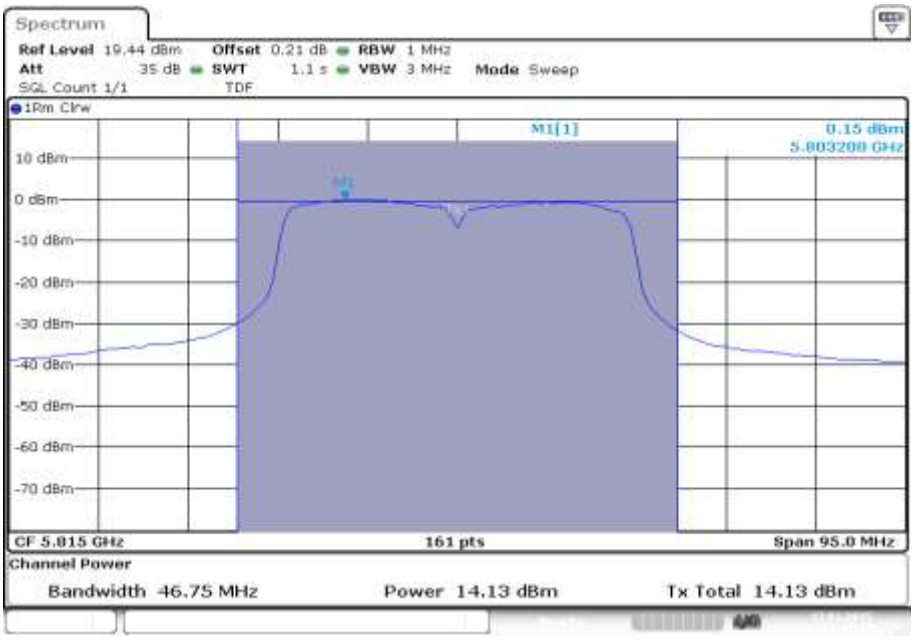
Date: 13.MAR.2015 10:30:07

Plot 20: OFDM/n40-mode, multi antenna, antenna 1, 5795 MHz



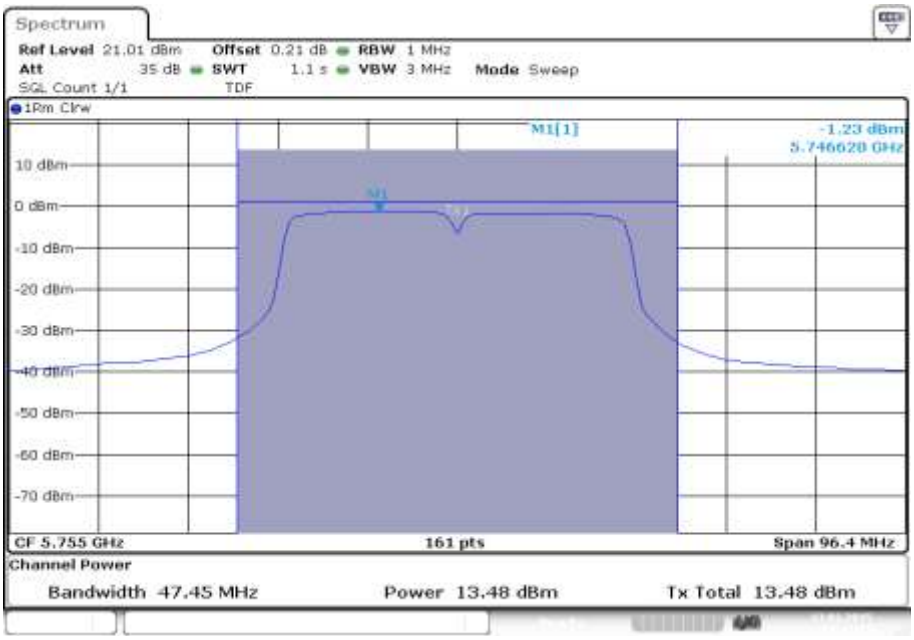
Date: 13.MAR.2015 10:34:38

Plot 21: OFDM/n40-mode, multi antenna, antenna 1, 5815 MHz



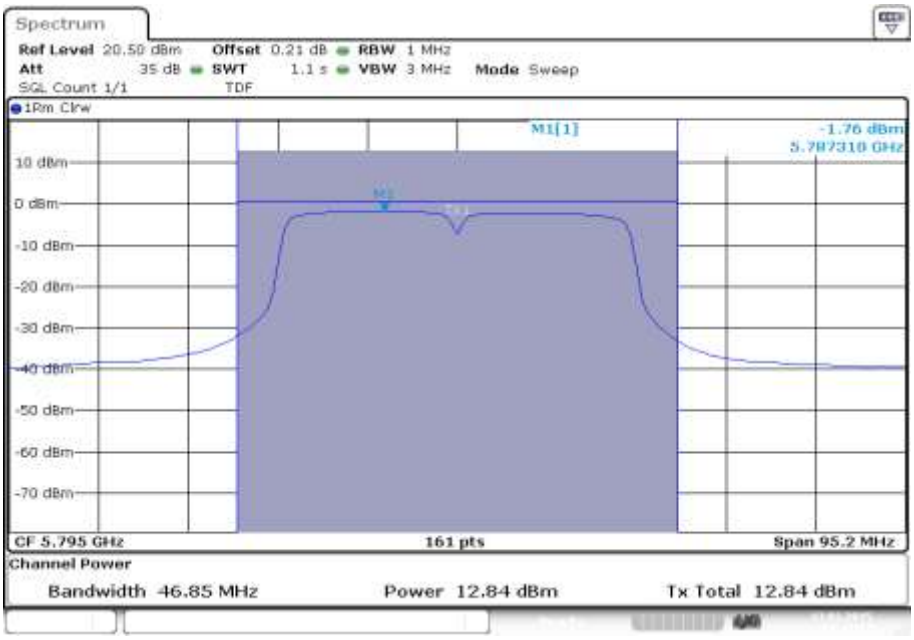
Date: 13.MAR.2015 10:40:10

Plot 22: OFDM/n40-mode, multi antenna, antenna 2, 5755 MHz



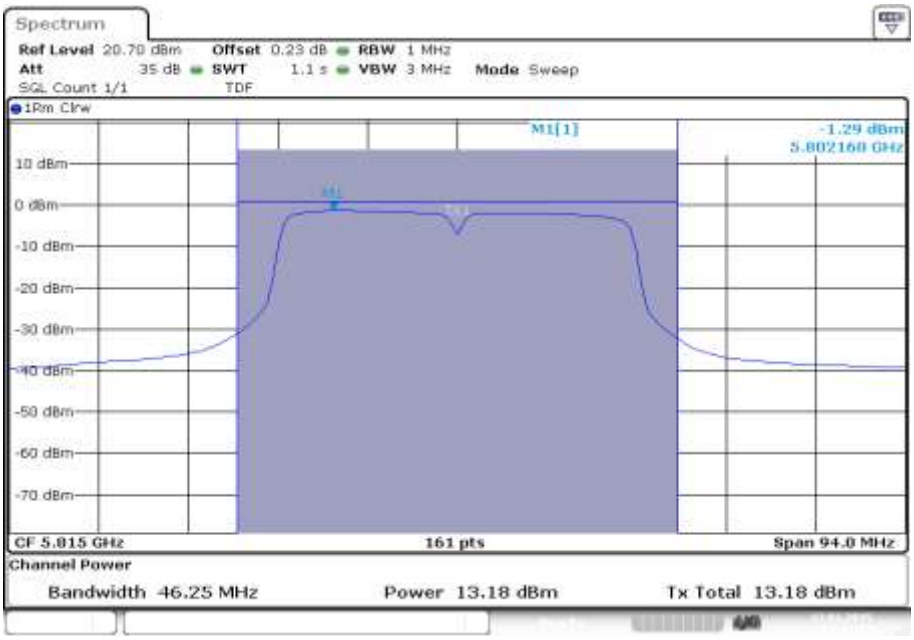
Date: 13.MAR.2015 12:17:05

Plot 23: OFDM/n40-mode, multi antenna, antenna 2, 5795 MHz



Date: 13.MAR.2015 12:19:22

Plot 24: OFDM/n40-mode, multi antenna, antenna 2, 5815 MHz



Date: 13.MAR.2015 12:21:29

12.5 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
According to: KDB789033 D02, F.	
Detector:	RMS
Sweep time:	≥10*(swp points)*(total on/off time)
Resolution bandwidth:	1 MHz (500 kHz for 5.8 GHz band)
Video bandwidth:	≥ 3xRBW
Span:	> EBW
Trace-Mode:	Max hold
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

Limits:

Power Spectral Density
power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5150 – 5250 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5250 – 5350 MHz) power spectral density conducted ≤ 11 dBm in any 1 MHz band (band 5470 – 5725 MHz) power spectral density conducted ≤ 30 dBm in any 500 kHz band (band 5725 – 5850 MHz)

Result: OFDM / a – mode single antenna

OFDM / a – mode	Power Spectral density [dBm/500kHz]			
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
incl. duty cycle correction	3.72	2.56	1.88	-/-

Verdict: Complies

Result: OFDM / n – mode HT20 single antenna

OFDM / n – mode HT20	Power Spectral density [dBm/500kHz]			
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
incl. duty cycle correction	5.93	3.31	2.58	-/-

Verdict: Complies

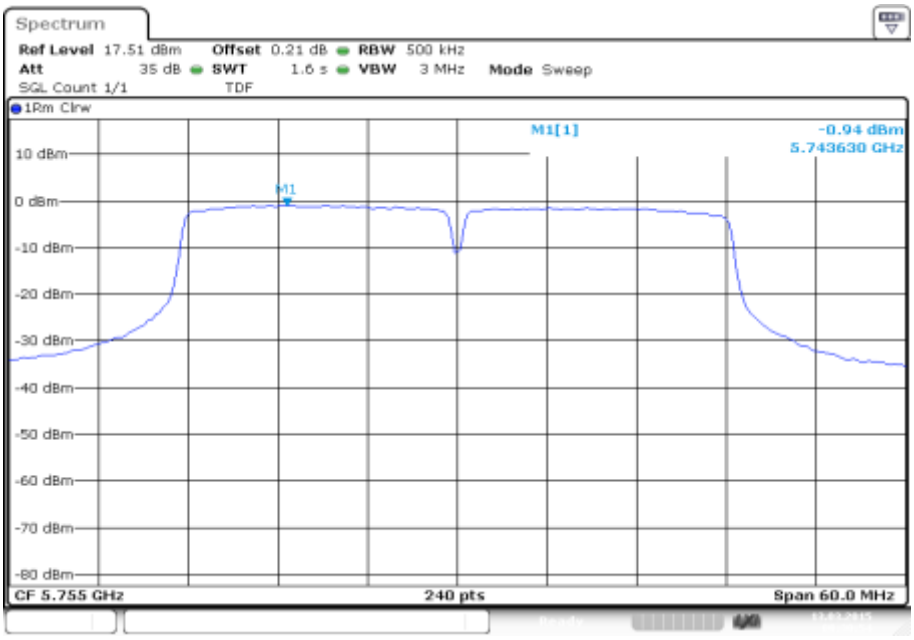
Result: OFDM / n – mode HT40

OFDM / n – mode HT40	Power Spectral density [dBm/500kHz]	
Channel	5755 MHz	5815 MHz
incl. duty cycle correction	-0.9	-1.0

Verdict: Complies

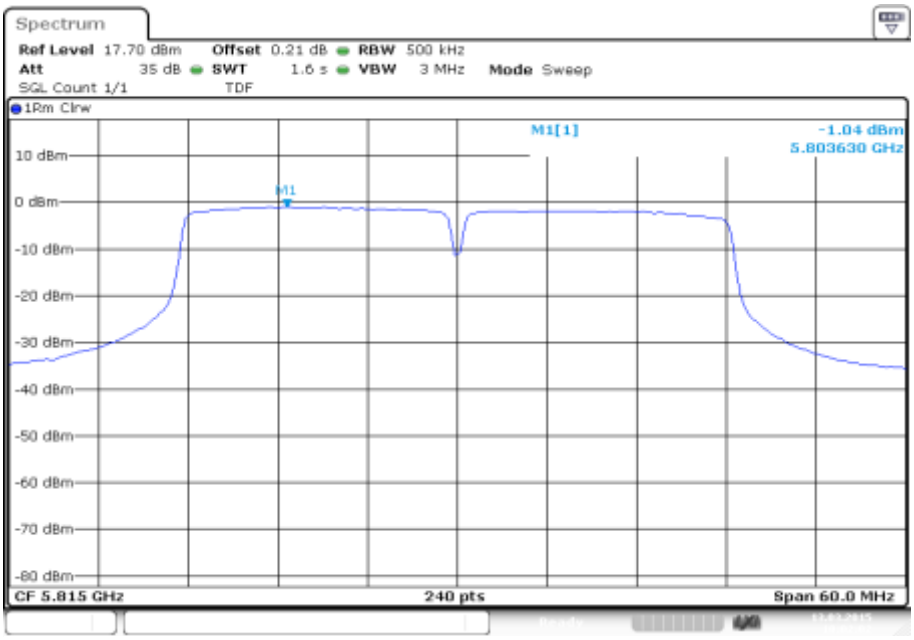
Plots:

Plot 1: OFDM/nHT40-mode, single antenna, antenna 1, 5755 MHz



Date: 13.MAR.2015 08:30:54

Plot 2: OFDM/nHT40-mode, single antenna, antenna 1, 5815 MHz



Date: 13.MAR.2015 10:02:02

12.6 Minimum Emission bandwidth for the band 5.725-5.85 GHz

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: KDB789033 D02, C.2.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Span:	40 MHz
Measurement procedure:	Using marker to find -6dBc frequencies
Trace-Mode:	Max hold (allow trace to stabilize)
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

Limits:

FCC	IC
Minimum Emission Bandwidth for the band 5.725-5.85 GHz	
The minimum 6 dB bandwidth shall be at least 500 kHz.	

Results: OFDM / 20 MHz

Modulation	6 dB bandwidth [MHz]		
Frequency	5745 MHz	5785 MHz	5825 MHz
a – mode	16.4	16.3	16.4
n – mode	17.4	17.4	16.7

Verdict: Complies

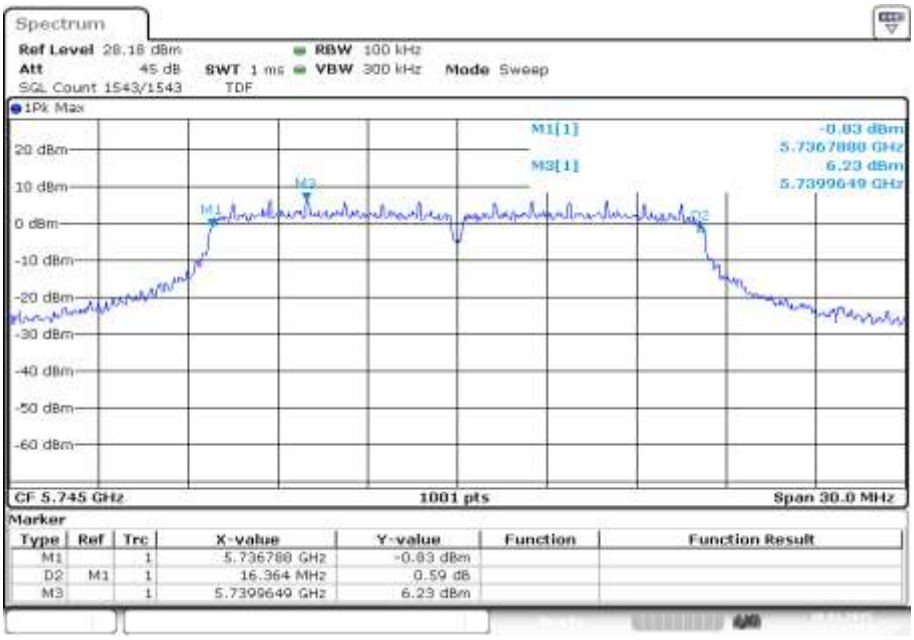
Results: OFDM / 40 MHz

Modulation	6 dB bandwidth [MHz]	
Frequency	5755 MHz	5815 MHz
n40 – mode	36.1	36.0

Verdict: Complies

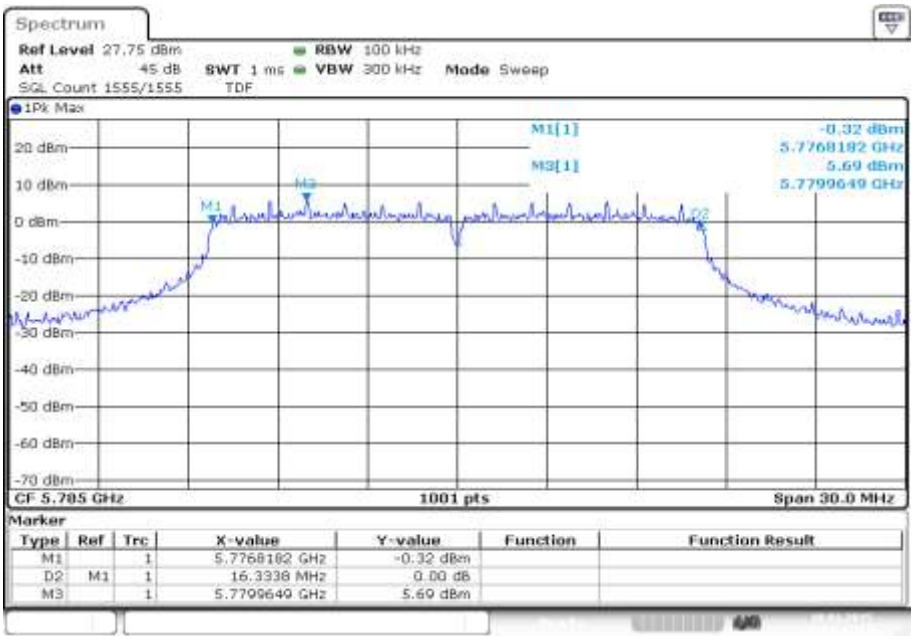
Plots:

Plot 1: OFDM/a-mode, single antenna, antenna 1, 5745 MHz



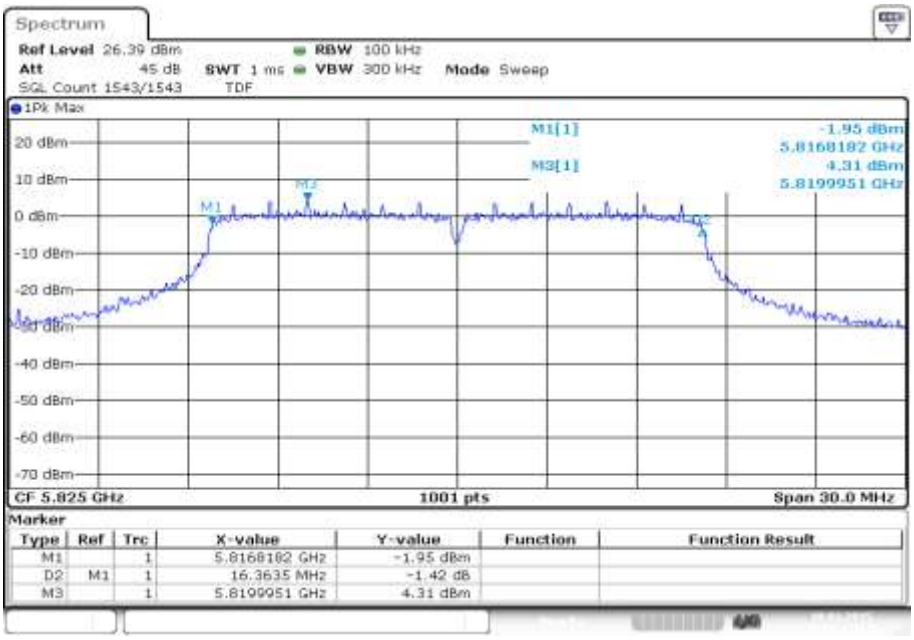
Date: 10.MAR.2015 14:32:40

Plot 2: OFDM/a-mode, single antenna, antenna 1, 5785 MHz



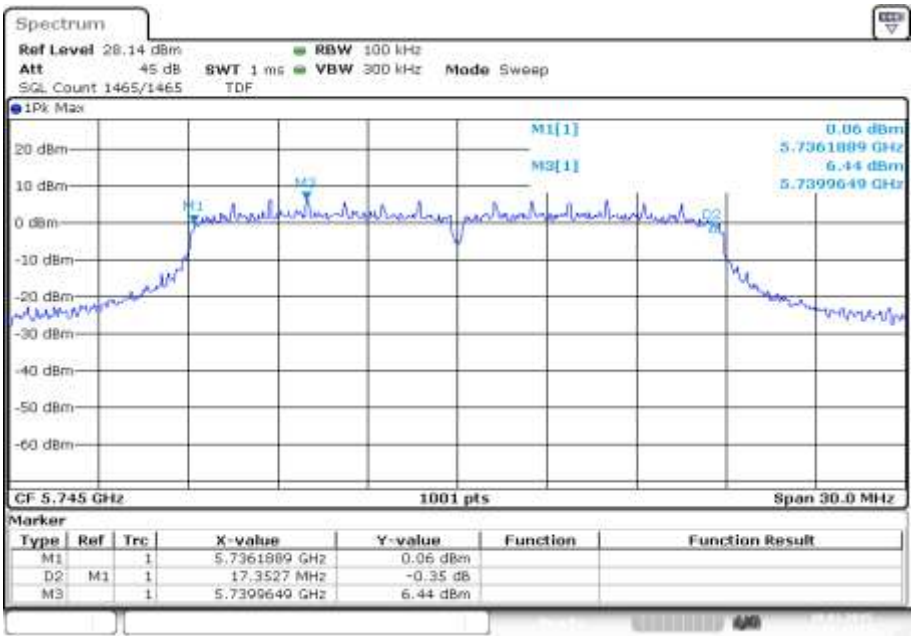
Date: 10.MAR.2015 14:35:56

Plot 3: OFDM/a-mode, single antenna, antenna 1, 5825 MHz



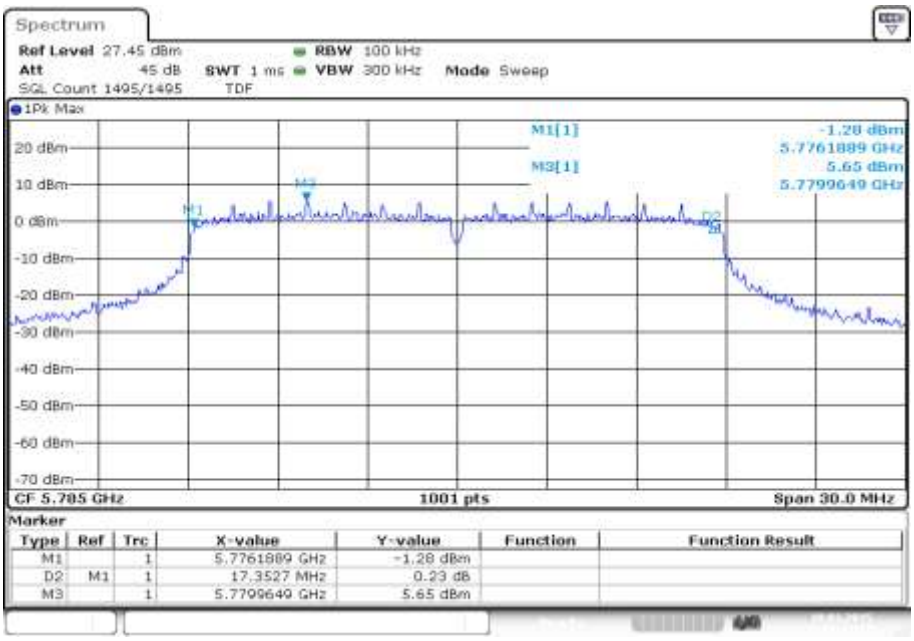
Date: 10.MAR.2015 14:51:33

Plot 4: OFDM/n-mode, single antenna, antenna 1, 5745 MHz



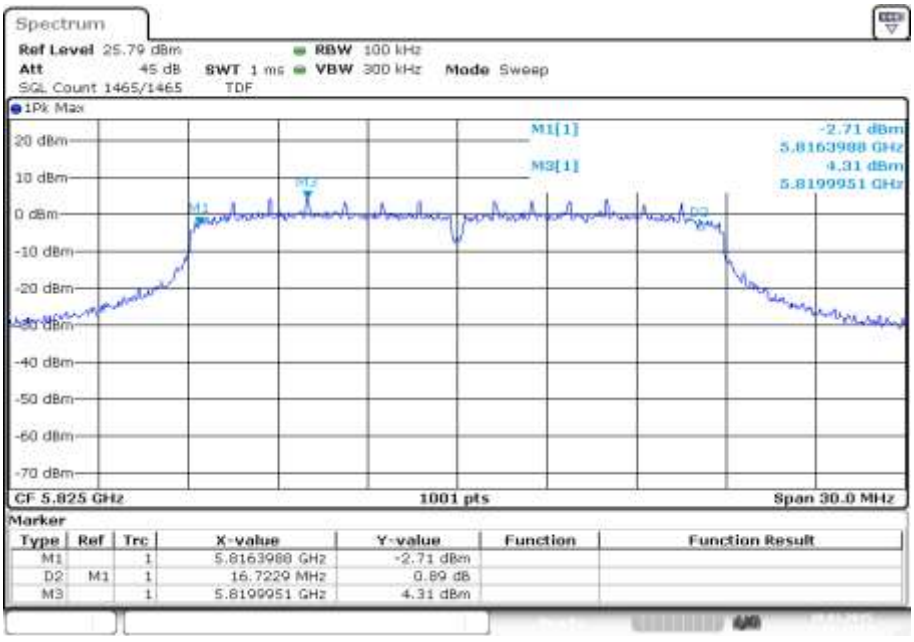
Date: 10.MAR.2015 16:19:55

Plot 5: OFDM/n-mode, single antenna, antenna 1, 5785 MHz



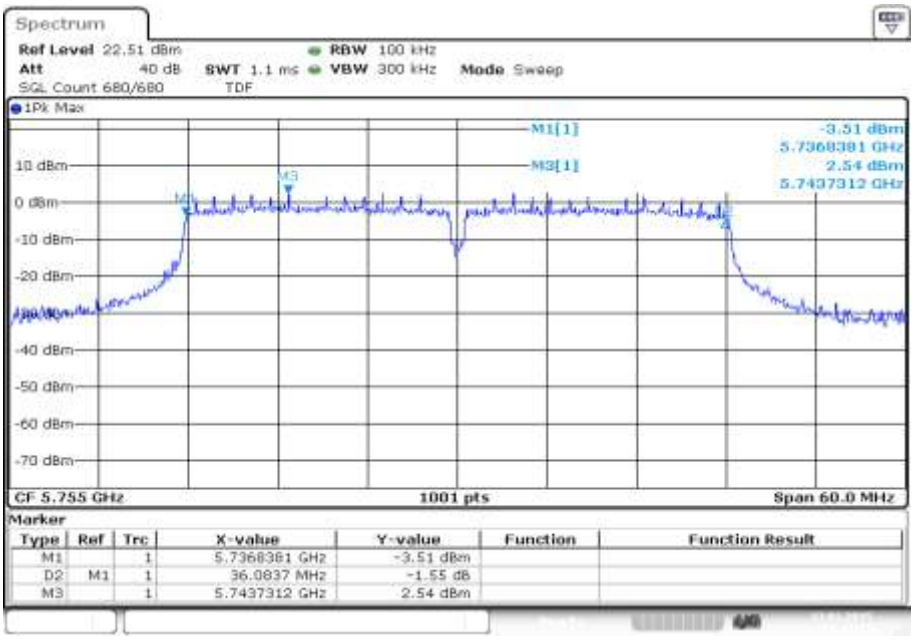
Date: 10.MAR.2015 16:24:27

Plot 6: OFDM/n-mode, single antenna, antenna 1, 5825 MHz



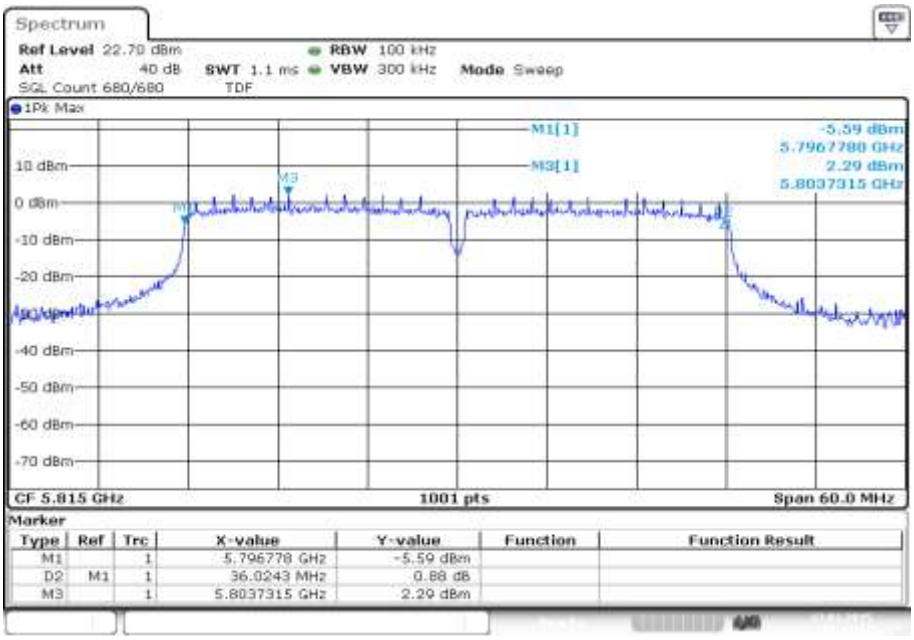
Date: 10.MAR.2015 16:28:58

Plot 7: OFDM/n40-mode, single antenna, antenna 1, 5755 MHz



Date: 13.MAR.2015 08:30:06

Plot 8: OFDM/n40-mode, single antenna, antenna 1, 5815 MHz



Date: 13.MAR.2015 10:01:12

12.7 Spectrum bandwidth – 26 dB bandwidth

Description:

Measurement of the 26 dB bandwidth of the modulated signal.

Measurement:

Measurement parameter	
According to: KDB789033 D02, C.1.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1% EBW
Video bandwidth:	≥ RBW
Span:	> complete signal!
Trace-Mode:	Max hold
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

Limits:

Spectrum Bandwidth – 26 dB Bandwidth
-/-

Result: OFDM / a – mode

OFDM / a – mode	26 dB BANDWIDTH [kHz]			
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
	25075	25424	23577	-/-

Verdict: Complies

Result: OFDM / n – mode HT20

OFDM / n – mode HT20	26 dB BANDWIDTH [kHz]			
Channel	5745 MHz	5785 MHz	5825 MHz	-/-
	25674	24975	24675	-/-

Verdict: Complies

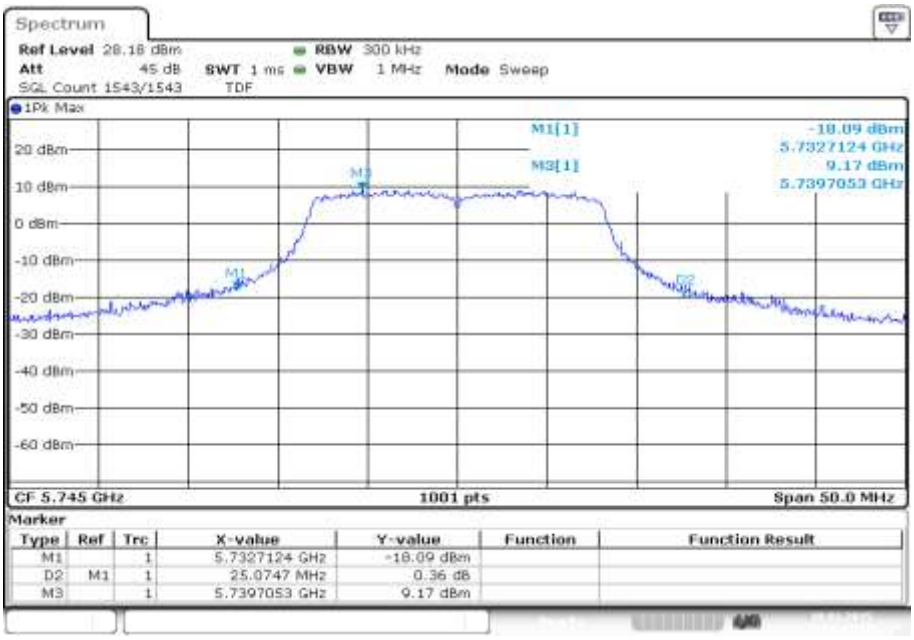
Result: OFDM / n – mode HT40

OFDM / n – mode HT40	26 dB BANDWIDTH [kHz]	
Channel	5755 MHz	5815 MHz
	57642	56404

Verdict: Complies

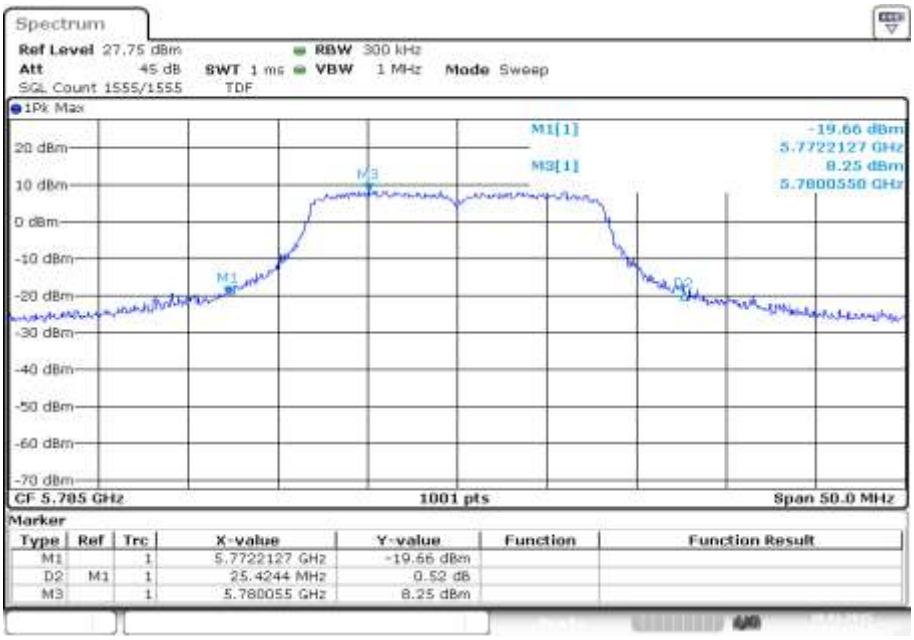
Plots: OFDM / a – mode

Plot 1: 5745 MHz



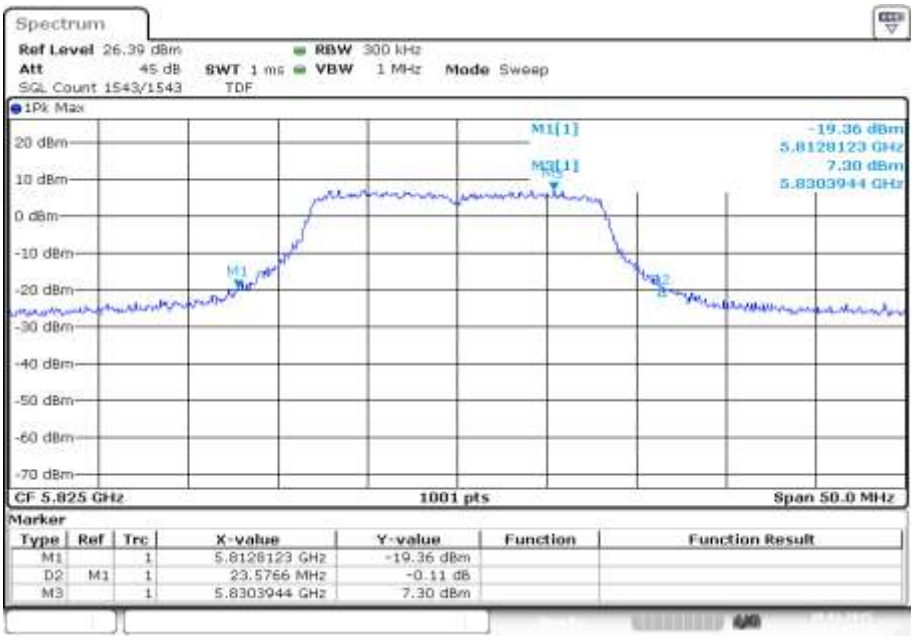
Date: 10.MAR.2015 14:32:21

Plot 2: 5785 MHz



Date: 10.MAR.2015 14:35:35

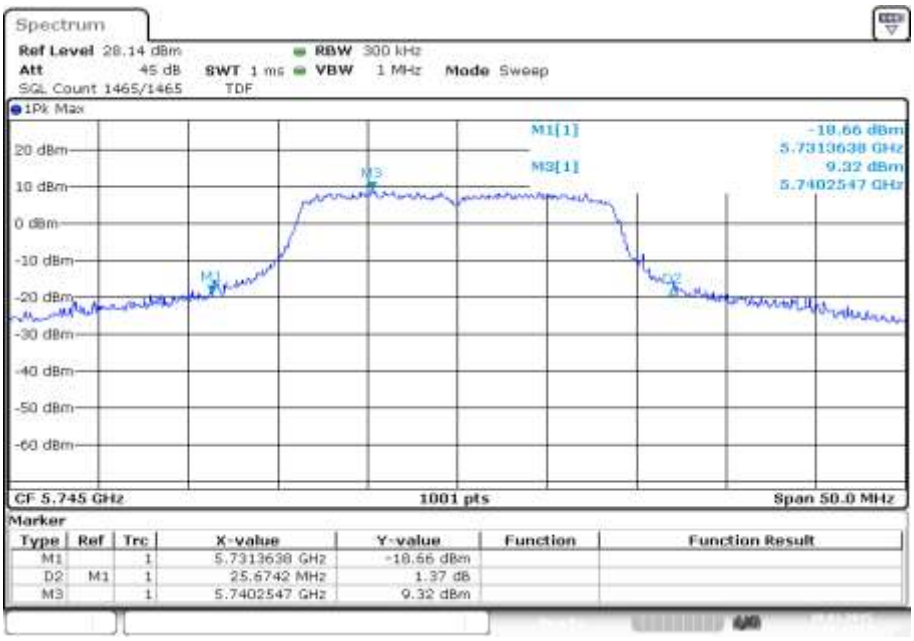
Plot 3: 5825 MHz



Date: 10.MAR.2015 14:51:23

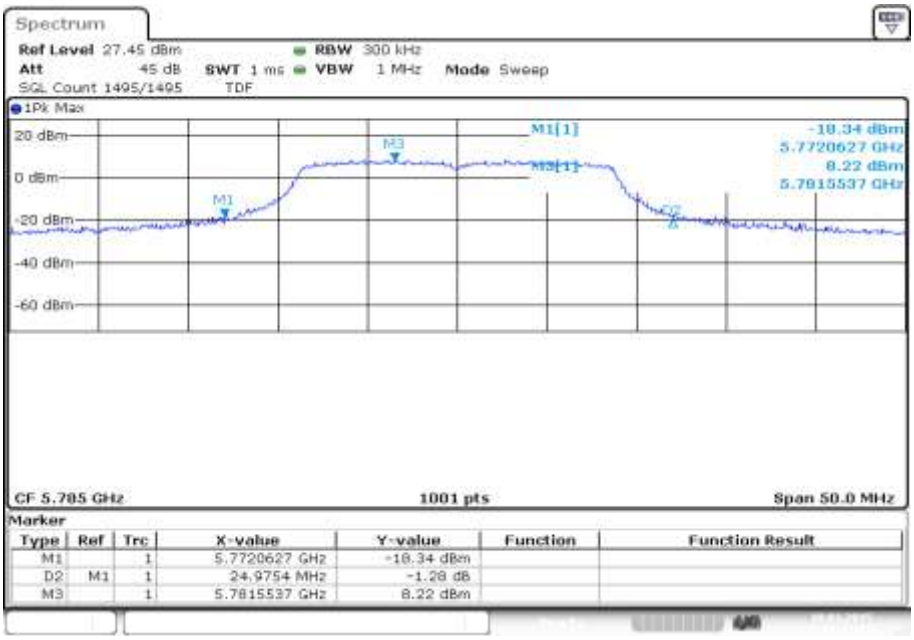
Plots: OFDM / n – mode HT20

Plot 1: 5745 MHz



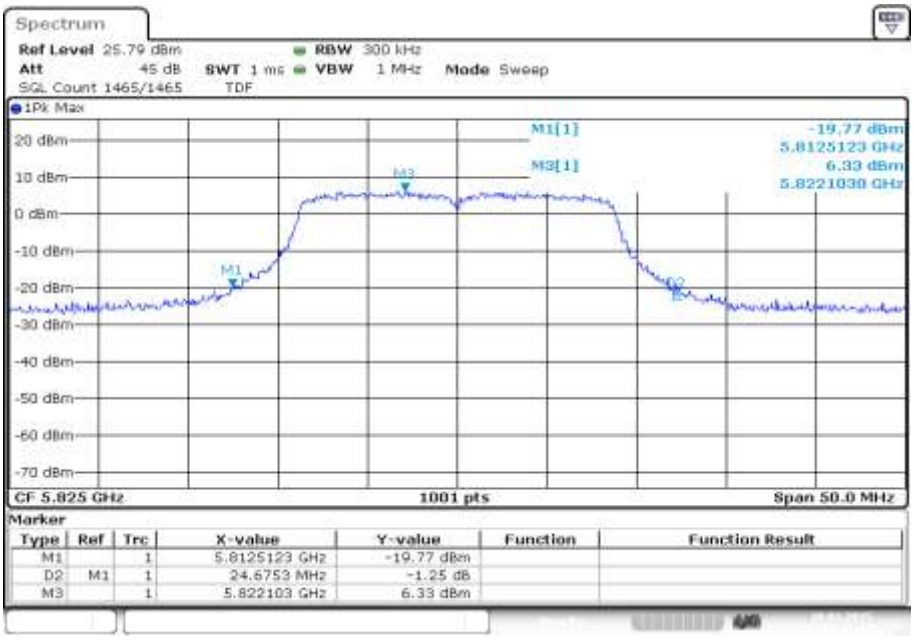
Date: 10.MAR.2015 16:19:37

Plot 2: 5785 MHz



Date: 10.MAR.2015 16:24:06

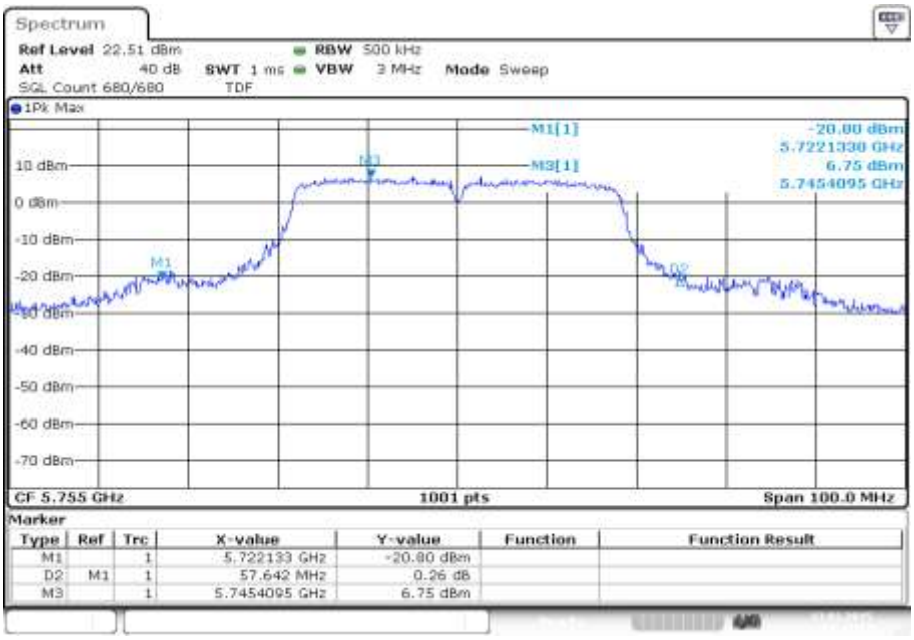
Plot 3: 5825 MHz



Date: 10.MAR.2015 16:28:49

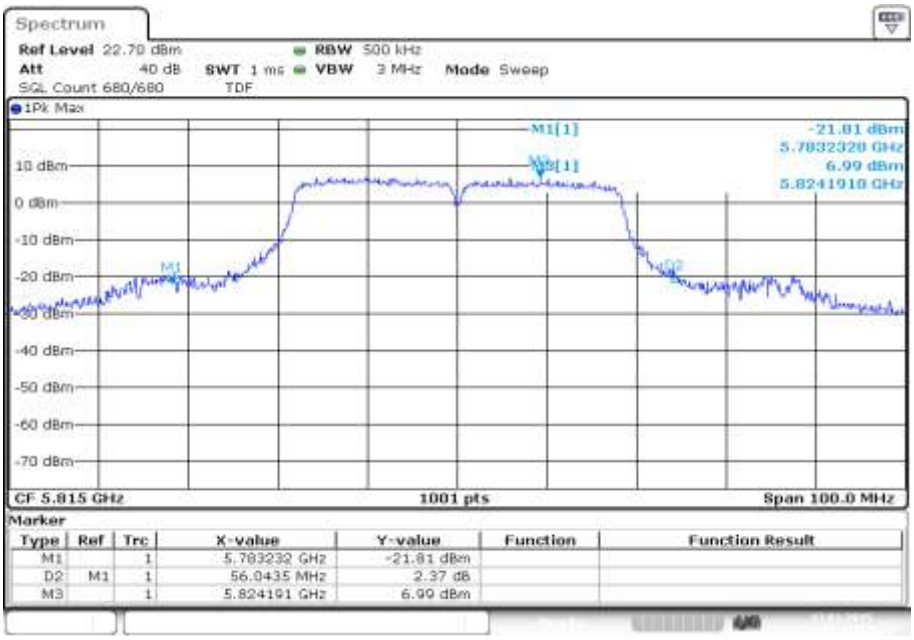
Plots: OFDM / n – mode HT40

Plot 1: 5755 MHz



Date: 13.MAR.2015 08:30:03

Plot 2: 5815 MHz



Date: 13.MAR.2015 10:01:09

12.8 Occupied bandwidth – 99% emission bandwidth

Description:

Measurement of the 99% bandwidth of the modulated signal acc. RSS-GEN.

Measurement:

Measurement parameter	
According to: KDB789033 D02, D.	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	300 kHz / 500 kHz
Video bandwidth:	1 MHz / 3 MHz
Span:	50 MHz / 100 MHz
Measurement procedure:	Measurement of the 99% bandwidth using the integration function of the analyzer
Trace-Mode:	Max hold (allow trace to stabilize)
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

Usage:

-/-	IC
Occupied Bandwidth – 99% emission bandwidth	
OBW is necessary for Emission Designator	

Result: OFDM / a – mode

OFDM / a – mode	99% BANDWIDTH [kHz]			
Channel	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz	-/-
	17133	17083	17083	-/-

Result: **No pass/fail criteria.**

Result: OFDM / n – mode HT20

OFDM / n – mode HT20 Channel	99% BANDWIDTH [kHz]			
	Lowest 5745 MHz	Middle 5785 MHz	Highest 5825 MHz	-/-
	18132	18132	17982	-/-

Result: **No pass/fail criteria.**

Result: OFDM / n – mode HT40

OFDM / n – mode HT40 Channel	99% BANDWIDTH [kHz]	
	Lowest 5755 MHz	Highest 5815 MHz
	36963	36963

Result: **No pass/fail criteria.**

12.9 Peak excursion measurements

Description:

Peak to average value.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	60 s / 120 s
Resolution bandwidth:	1 MHz
Video bandwidth:	≥ 3 MHz
Span:	> Complete signal
Trace-Mode:	Max hold
Used test setup:	see chapter 7.5
Measurement uncertainty:	see chapter 8

Limits:

Peak excursion value
Does not exceed 13 dB.

Results:

Modulation OFDM / a – mode	Peak excursion value		
Channel	5745 MHz	5785 MHz	5825 MHz
RMS	3.72	2.56	1.88
Peak	15.55	15.05	13.83
Peak excursion value	11.83	12.49	11.95

Verdict: Complies

Results:

Modulation OFDM / n – mode HT20	Peak excursion value		
Channel	5745 MHz	5785 MHz	5825 MHz
RMS	5.93	3.31	2.58
Peak	15.45	14.81	13.56
Peak excursion value	9.52	11.50	10.98

Verdict: Complies

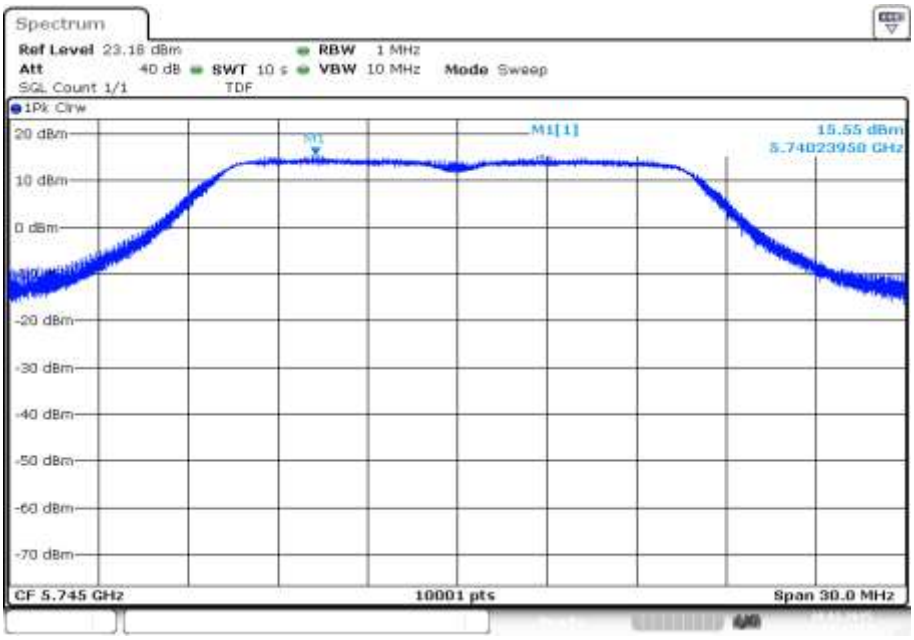
Results:

Modulation OFDM / n – mode HT40	Peak excursion value	
Channel	5755 MHz	5815 MHz
RMS	-0.9	-1.0
Peak	11.56	11.72
Peak excursion value	12.46	12.72

Verdict: Complies

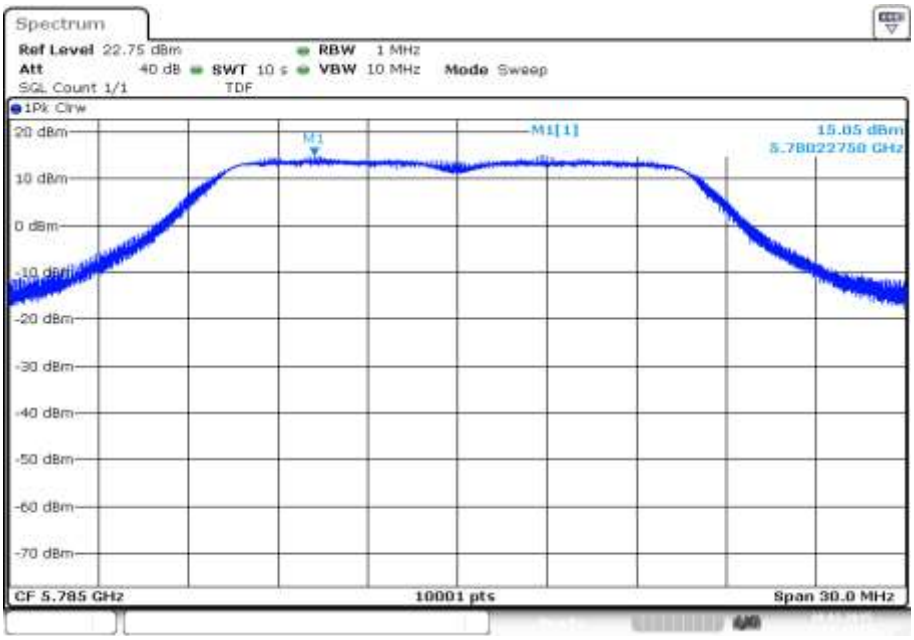
Plots: OFDM / a – mode

Plot 1: 5745 MHz



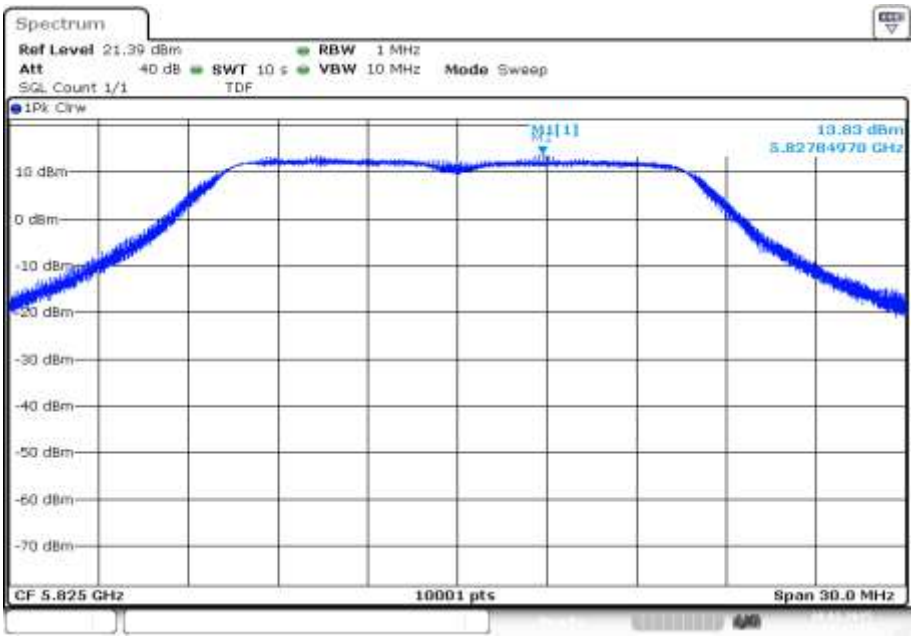
Date: 10.MAR.2015 14:32:59

Plot 2: 5785 MHz



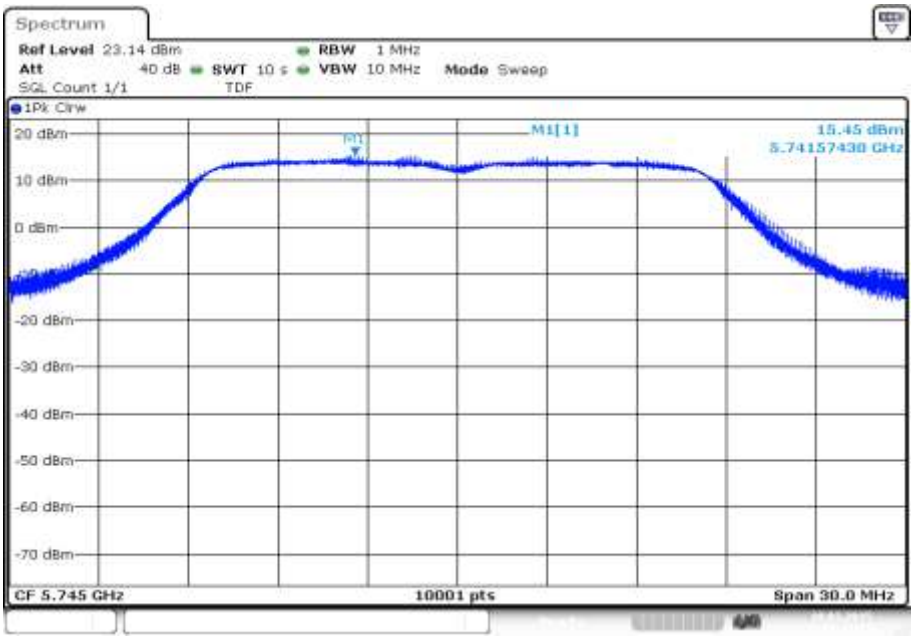
Date: 10.MAR.2015 14:36:16

Plot 3: 5825 MHz



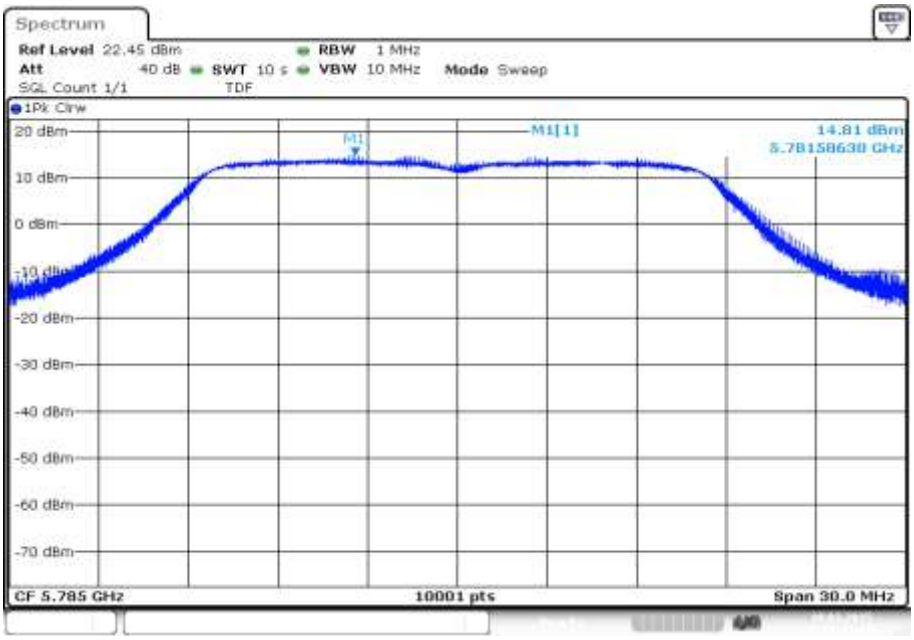
Plots: OFDM / n – mode HT20

Plot 1: 5745 MHz



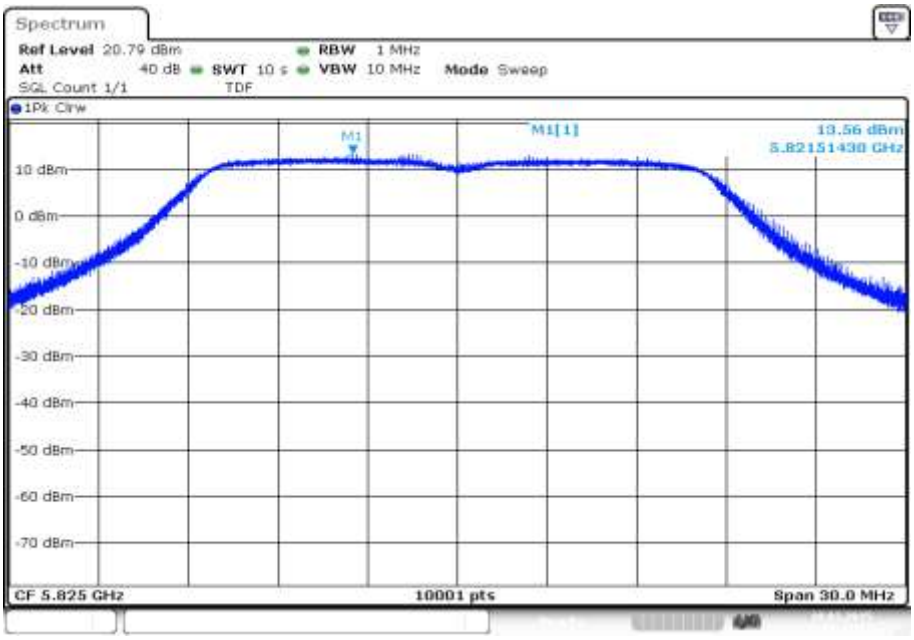
Date: 10.MAR.2015 16:20:15

Plot 2: 5785 MHz



Date: 10.MAR.2015 16:24:47

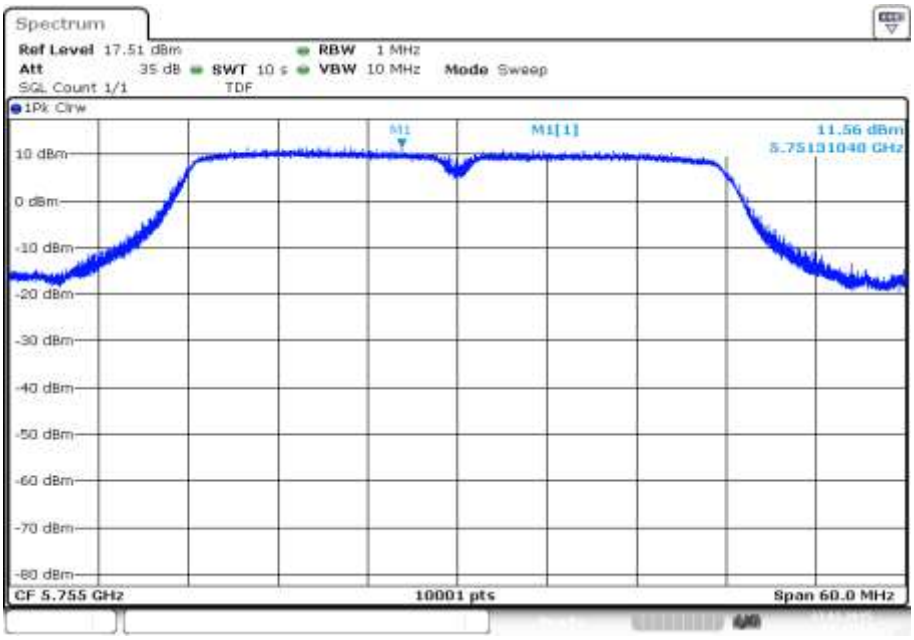
Plot 3: 5825 MHz



Date: 10.MAR.2015 16:29:22

Plots: OFDM / n – mode HT40

Plot 1: 5755 MHz



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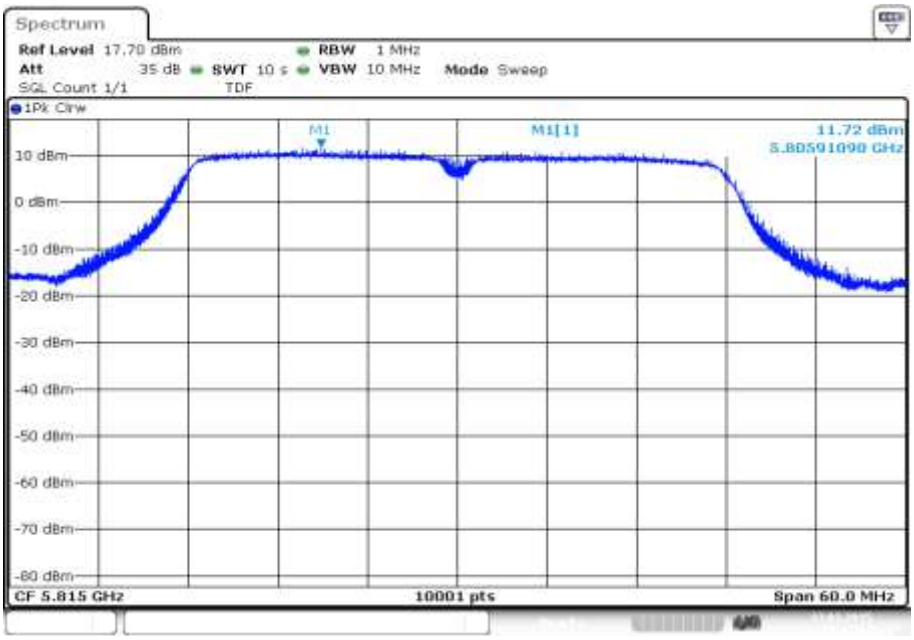
Plot 2: 5815 MHz



Date: 13.MAR.2015 10:01:32

12.10 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
According to: KDB789033 D02, G.	
Detector:	Quasi Peak below 1 GHz (alternative Peak) Peak above 1 GHz / RMS
Sweep time:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: ≥ 3 MHz / 1 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold / Average with 100 counts + 20 log (1 / X) for duty cycle lower than 100 %
Used test setup:	see chapter 7.1, 7.2, 7.3
Measurement uncertainty:	see chapter 8

Limits:

TX Spurious Emissions Radiated		
§15.209		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3
§15.407		
Outside the restricted bands!	-27 dBm / MHz	

Results: OFDM / a – mode

TX Spurious Emissions Radiated [dBµV/m]								
OFDM a – mode								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
4880	PP	52.9	4880	PP	53.2	3884	PP	51.9
7660	PP	49.8	7714	PP	49.3	7766	PP	45.9
17224	PP	47.0				17473	PP	45.4

Verdict: Complies

Results: OFDM / n – modeHT20

TX Spurious Emissions Radiated [dBµV/m]								
OFDM n – mode HT20								
5745 MHz			5785 MHz			5825 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
4800	PP	56.3	4800	PP	57.1	4800	PP	57.3
4800	PP	51.7	4800	AVG	52.9	4800	AVG	53.0
7660	PP	45.5				17475	PP	38.6
17227	PP	44.3						

Verdict: Complies

Results: OFDM / n – modeHT40

TX Spurious Emissions Radiated [dBµV/m]								
OFDM n – mode HT40								
5755 MHz			5815 MHz			-/-		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
4720	PP	52.3	3876	PP	48.9	-/-		
5080	PP	50.7	4720	PP	51.3			
7673	PP	49.6	7753	PP	46.1			
17259	PP	41.0	17440	PP	36.9			

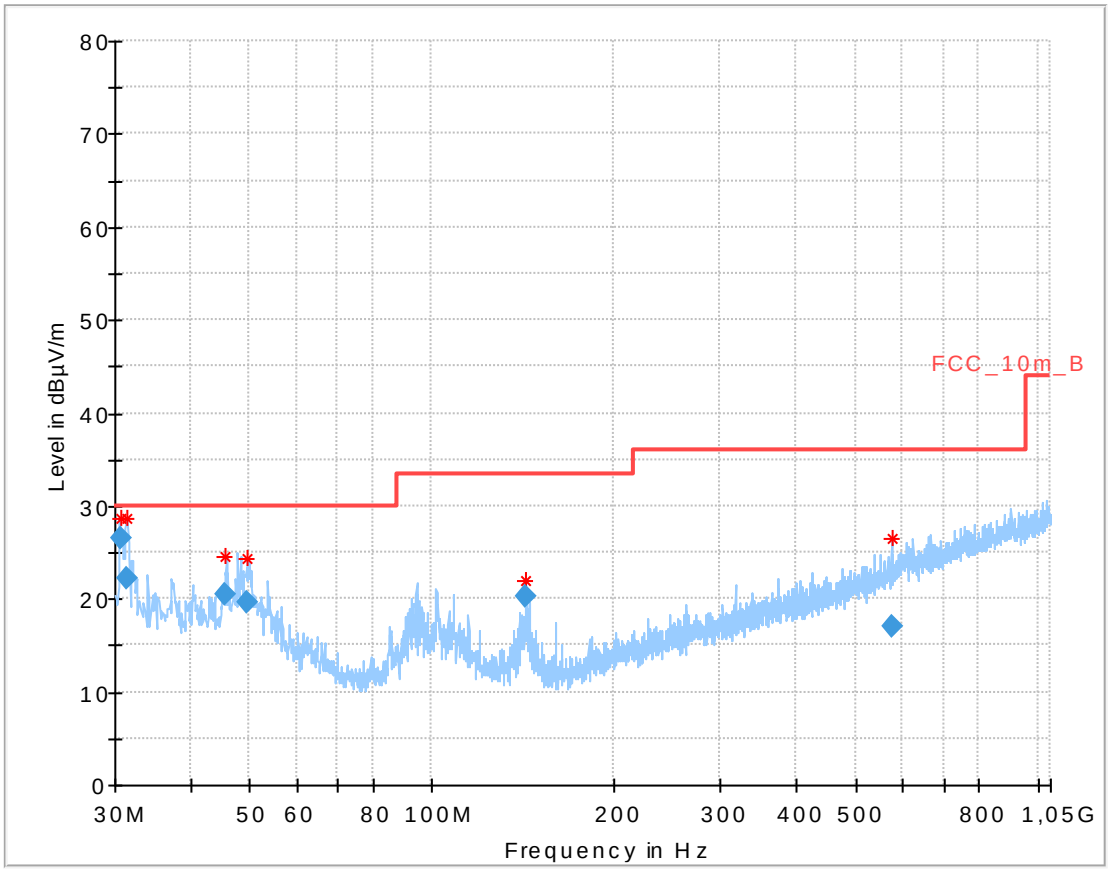
Verdict: Complies

Note:

Results of the OFDM / n – mode HT20 and HT40 are added to show the behaviour of the EUT.

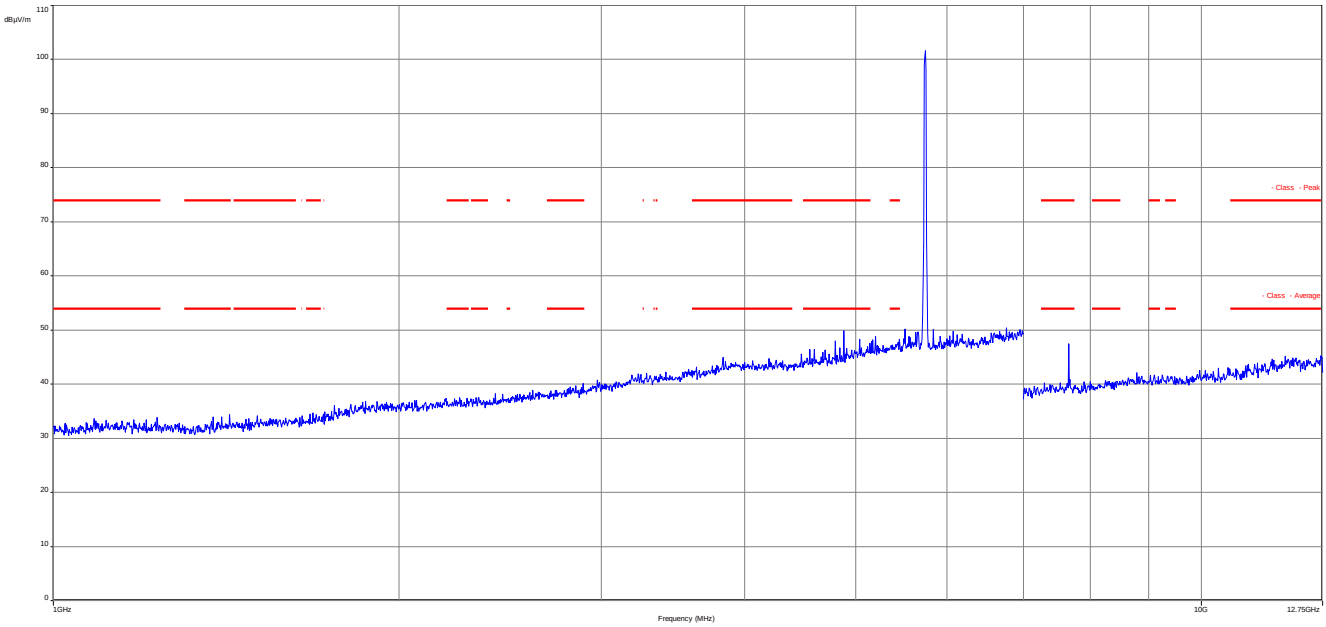
Plots: OFDM / a – mode

Plot 1: 30 MHz to 1 GHz, 5745 MHz, vertical & horizontal polarization

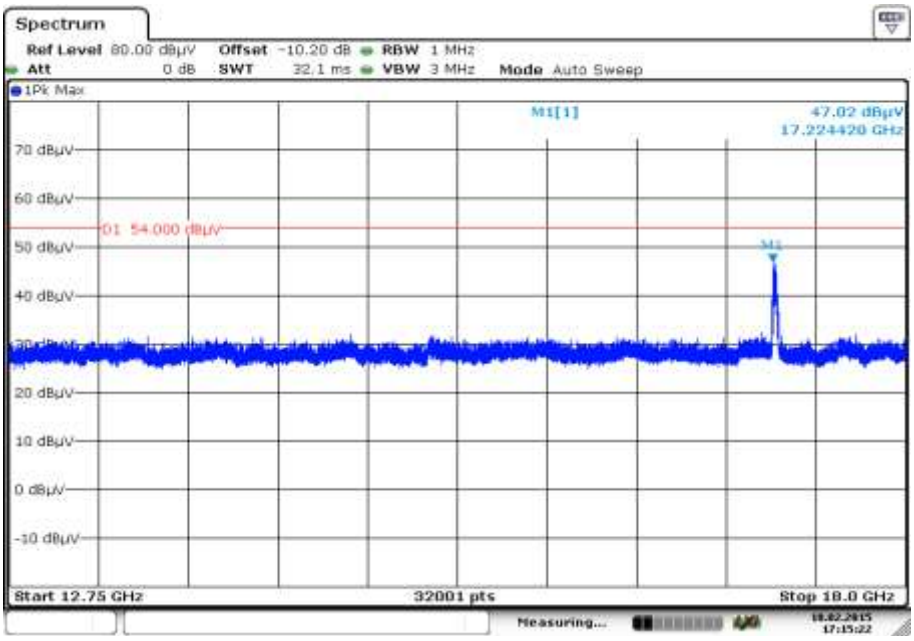


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.619519	26.55	30.00	3.45	1000.0	120.000	101.0	V	84	13.4
31.419000	22.13	30.00	7.87	1000.0	120.000	170.0	V	85	13.5
45.754050	20.55	30.00	9.45	1000.0	120.000	100.0	V	83	13.7
49.509300	19.68	30.00	10.32	1000.0	120.000	101.0	V	173	12.8
143.283150	20.37	33.50	13.13	1000.0	120.000	101.0	V	-6	8.8
573.250050	16.97	36.00	19.03	1000.0	120.000	170.0	V	263	20.0

Plot 2: 1 GHz to 12.75 GHz, 5745 MHz, vertical & horizontal polarization



Plot 3: 12 GHz to 18 GHz, 5745 MHz, vertical & horizontal polarization



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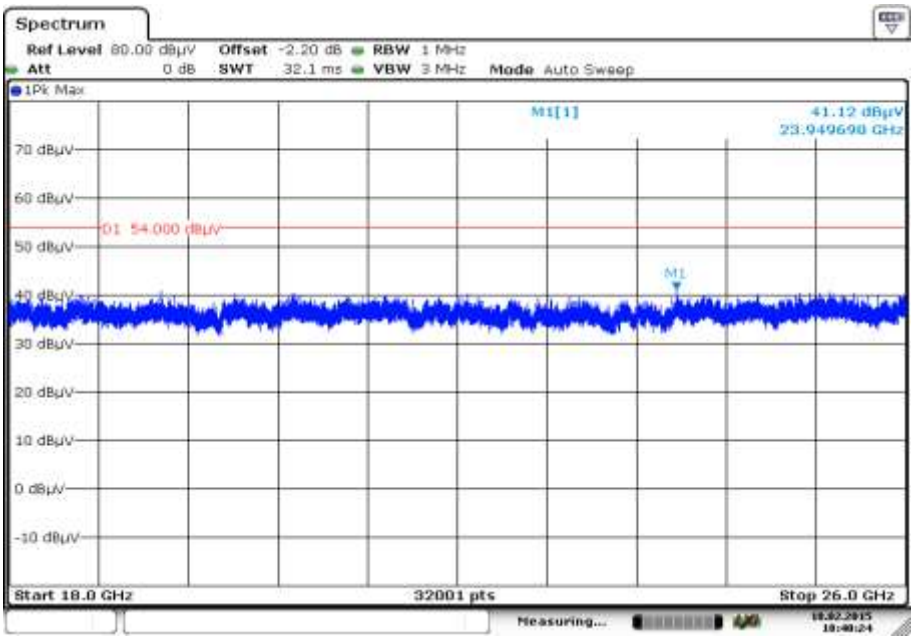
Plot 4: 18 GHz to 26 GHz, 5745 MHz, vertical & horizontal polarization



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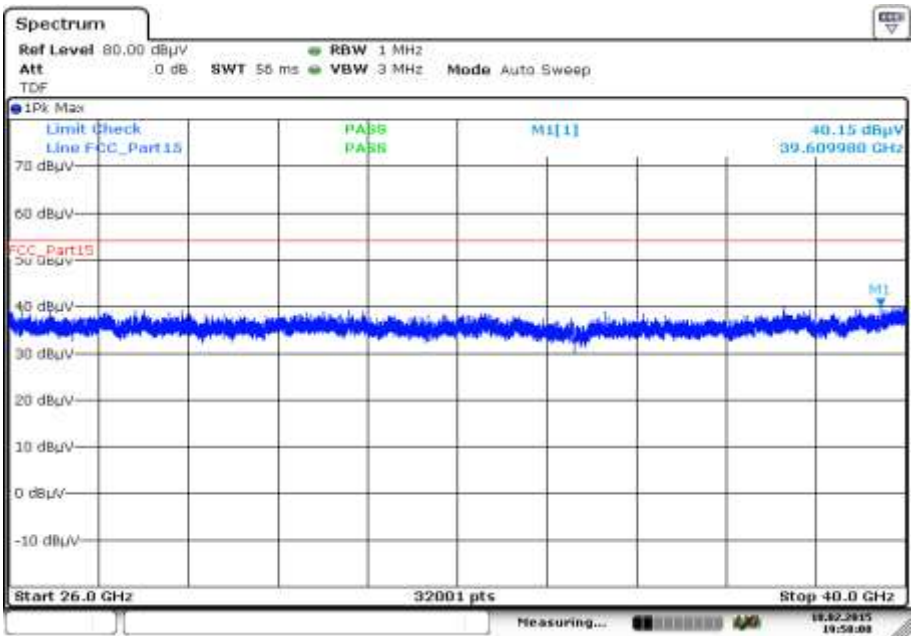
Plot 5: 26 GHz to 40 GHz, 5745 MHz, vertical & horizontal polarization



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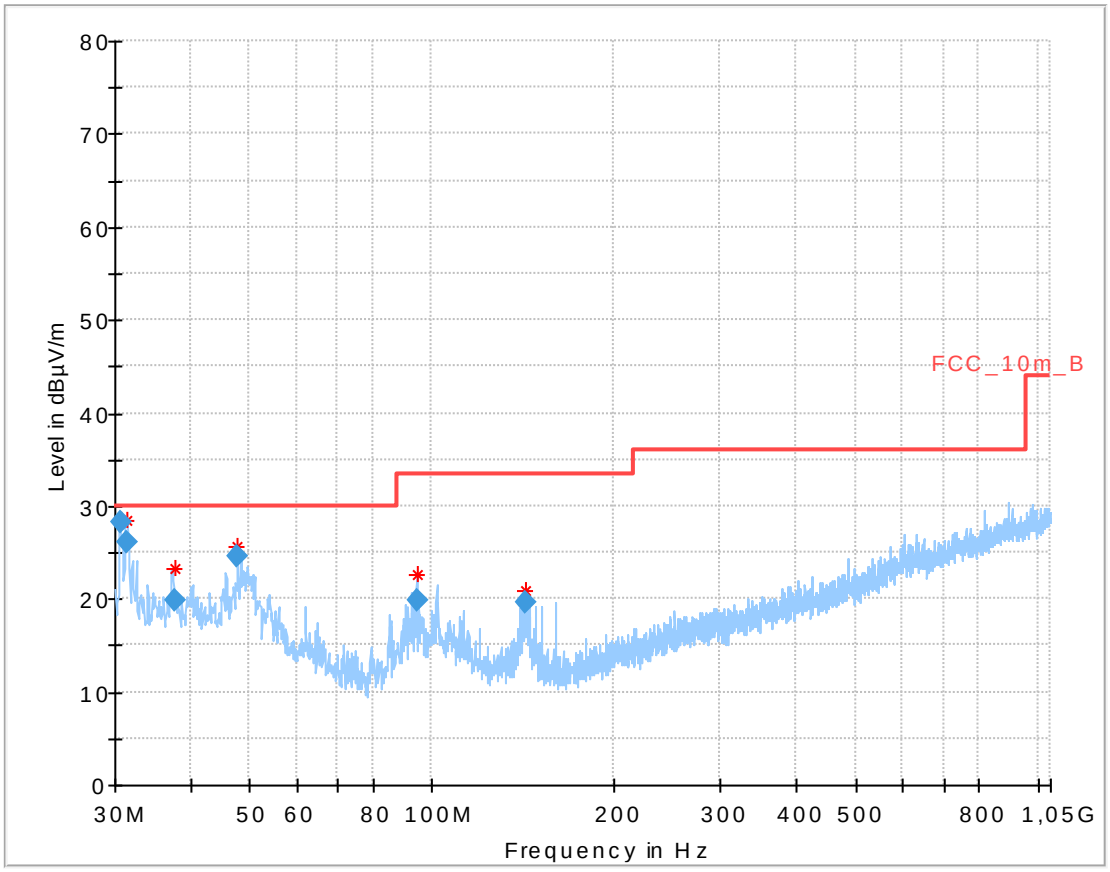
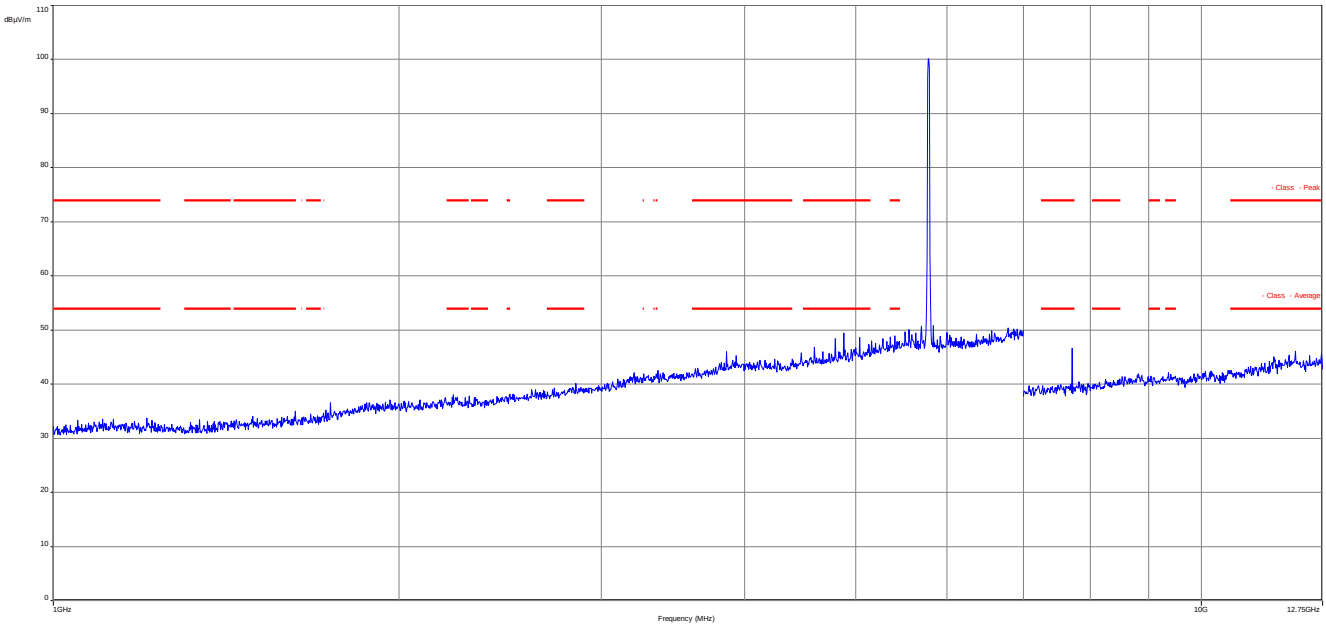
Plot 6: 30 MHz to 1 GHz, 5785 MHz, vertical & horizontal polarization

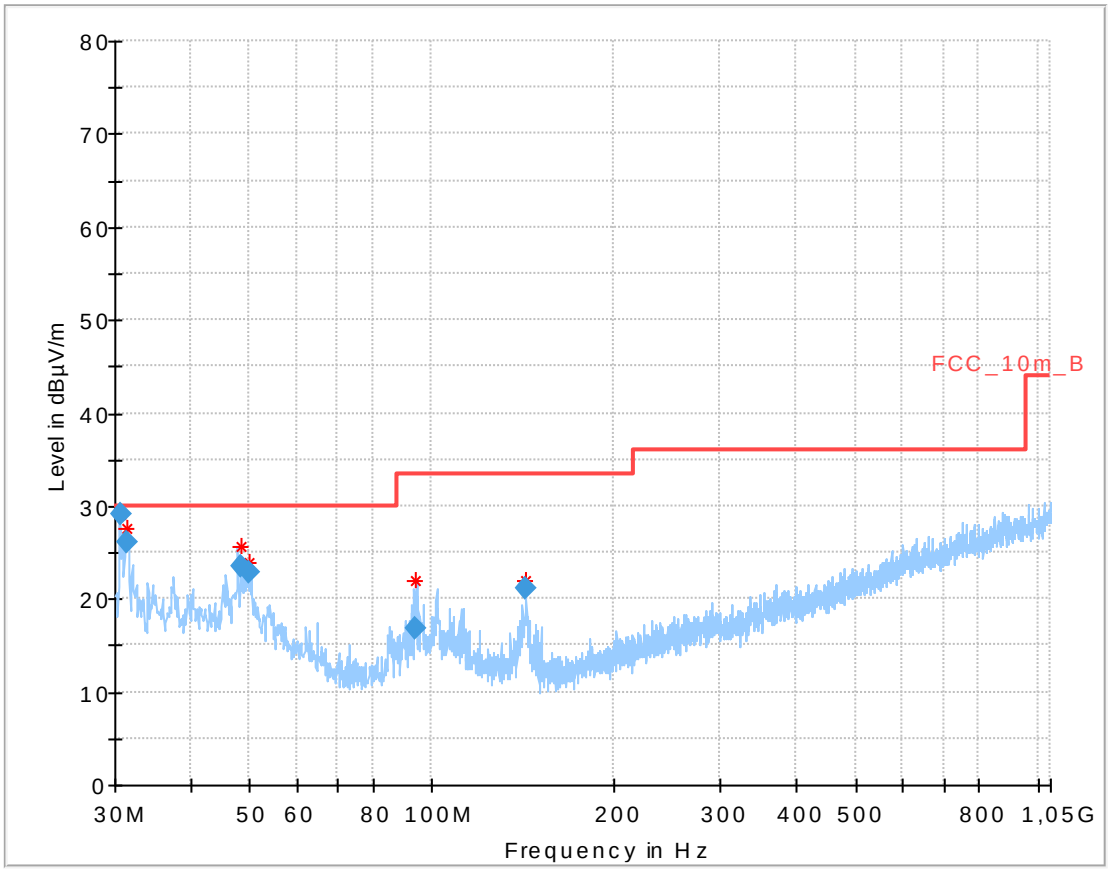


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.648101	28.29	30.00	1.71	1000.0	120.000	101.0	V	-25	13.4
31.399050	26.15	30.00	3.85	1000.0	120.000	170.0	V	83	13.5
37.777350	19.88	30.00	10.12	1000.0	120.000	98.0	V	-6	13.9
47.781600	24.61	30.00	5.39	1000.0	120.000	98.0	V	-7	13.2
94.386300	19.89	33.50	13.61	1000.0	120.000	100.0	V	-6	11.2
143.319600	19.70	33.50	13.80	1000.0	120.000	170.0	V	295	8.8

Plot 7: 1 GHz to 12.75 GHz, 5785 MHz, vertical & horizontal polarization

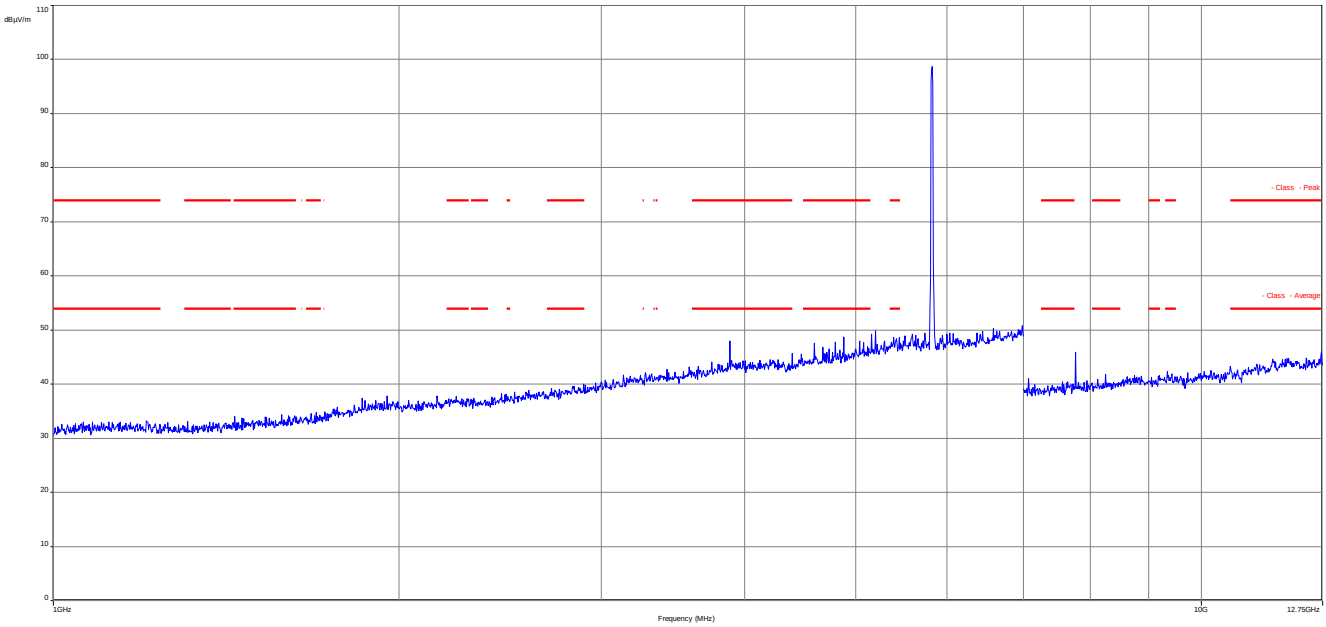


Plot 8: 30 MHz to 1 GHz, 5825 MHz, vertical & horizontal polarization

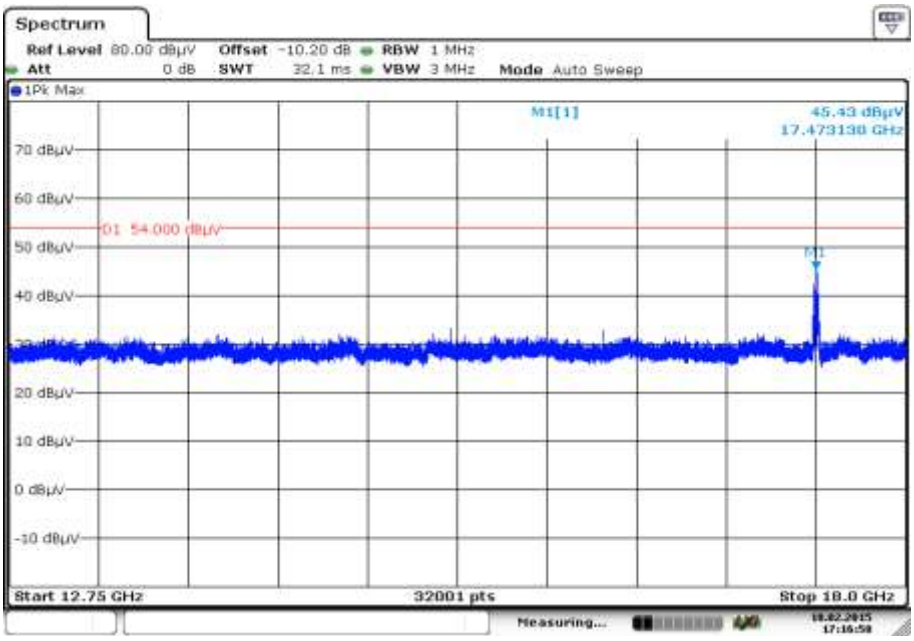


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.626179	29.11	30.00	0.89	1000.0	120.000	101.0	V	-25	13.4
31.380900	26.01	30.00	3.99	1000.0	120.000	170.0	V	174	13.5
48.441000	23.43	30.00	6.57	1000.0	120.000	98.0	V	82	13.0
49.841250	22.87	30.00	7.13	1000.0	120.000	98.0	V	84	12.7
94.095150	16.82	33.50	16.68	1000.0	120.000	100.0	V	18	11.2
143.313450	21.16	33.50	28.34	1000.0	120.000	170.0	V	286	8.8

Plot 9: 1 GHz to 12.75 GHz, 5825 MHz, vertical & horizontal polarization



Plot 10: 12 GHz to 18 GHz, 5825 MHz, vertical & horizontal polarization



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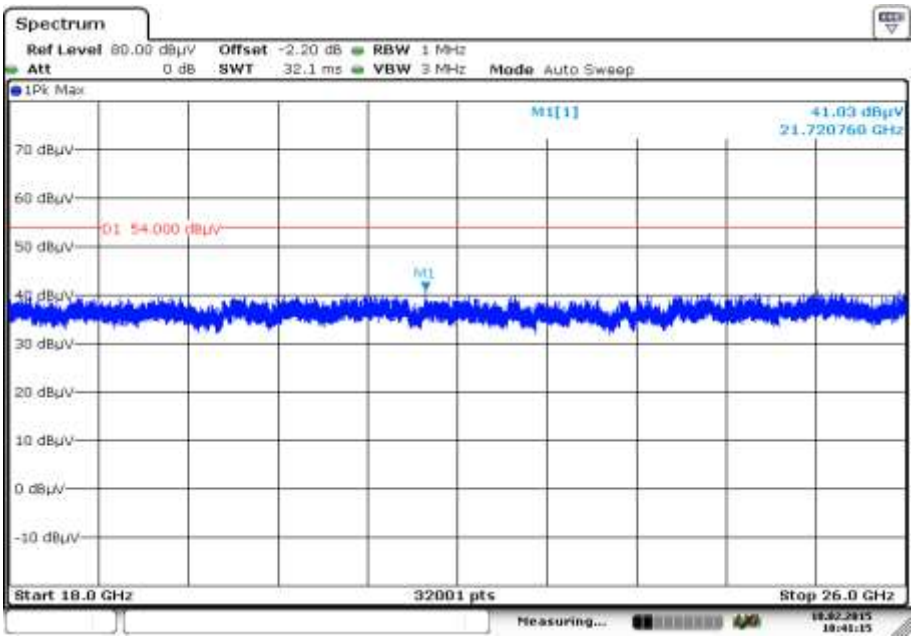
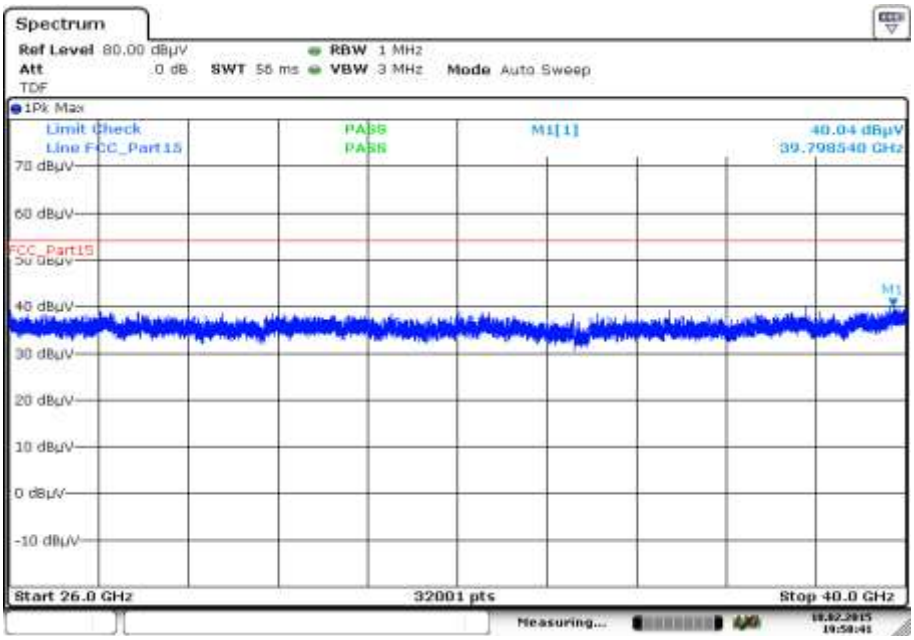
Plot 11: 18 GHz to 26 GHz, 5825 MHz, vertical & horizontal polarization



Date: 18.FEB.2015 18:41:16

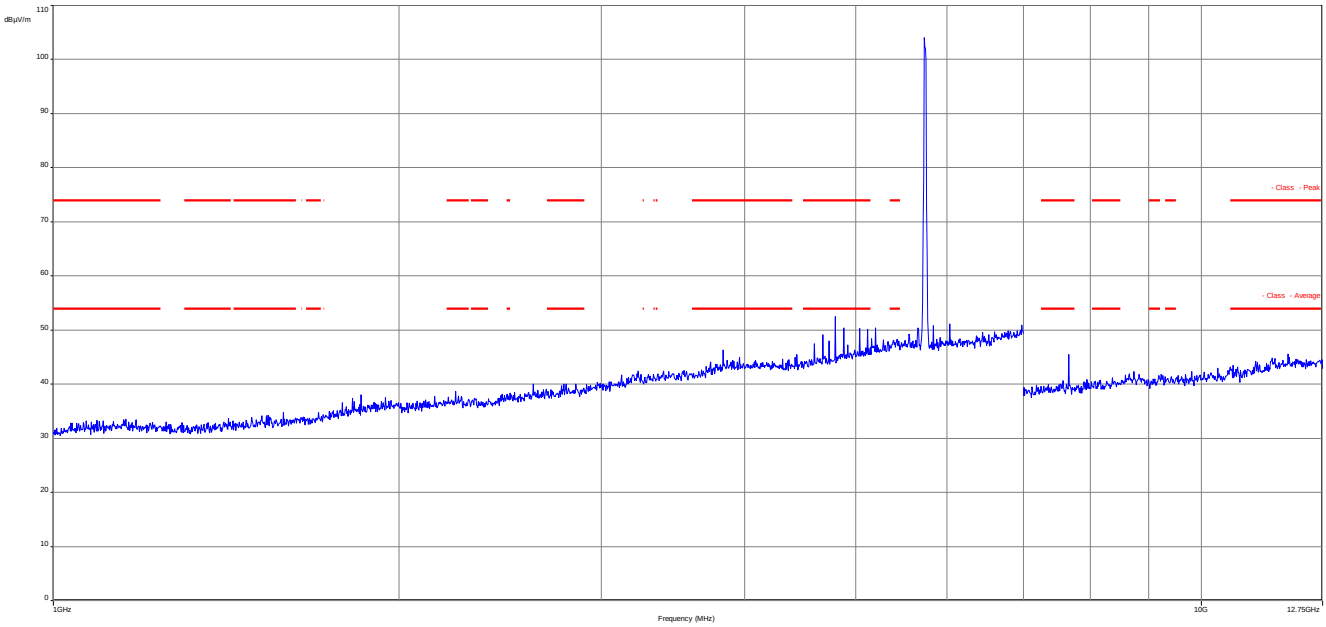
Plot 12: 26 GHz to 40 GHz, 5825 MHz, vertical & horizontal polarization



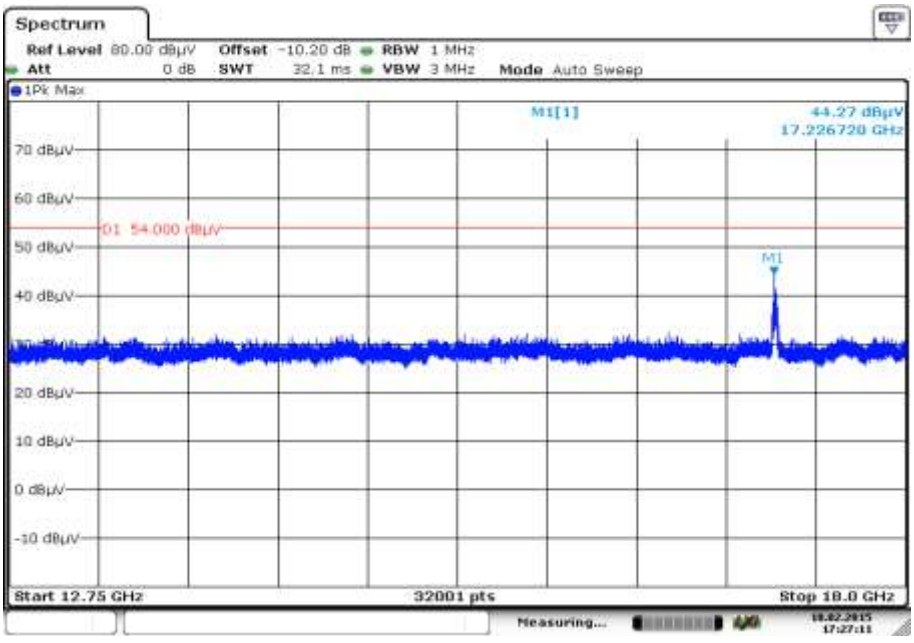
Date: 18.FEB.2015 19:58:41

Plots: OFDM / n – mode HT20

Plot 1: 1 GHz to 12.75 GHz, 5745 MHz, vertical & horizontal polarization

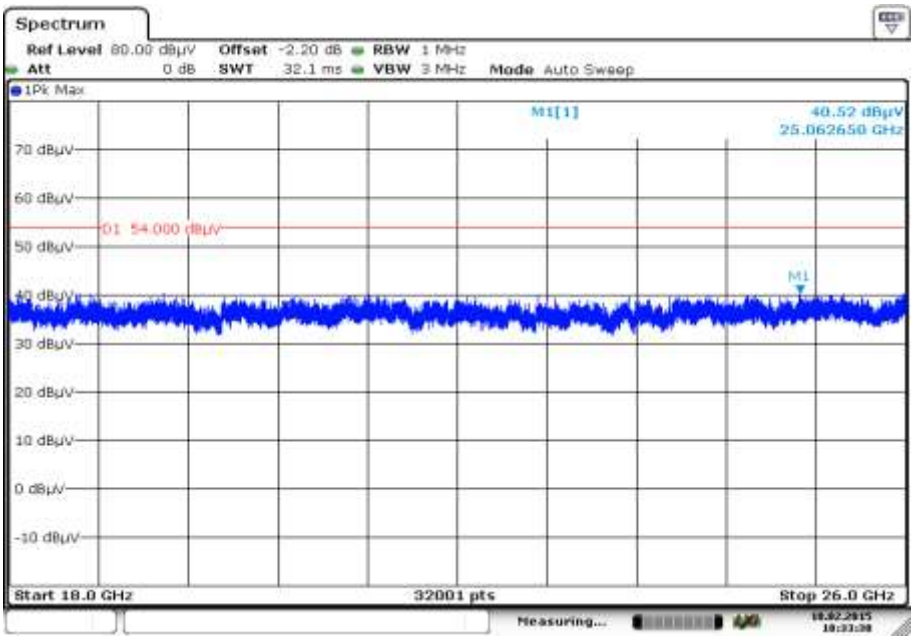


Plot 2: 12 GHz to 18 GHz, 5745 MHz, vertical & horizontal polarization



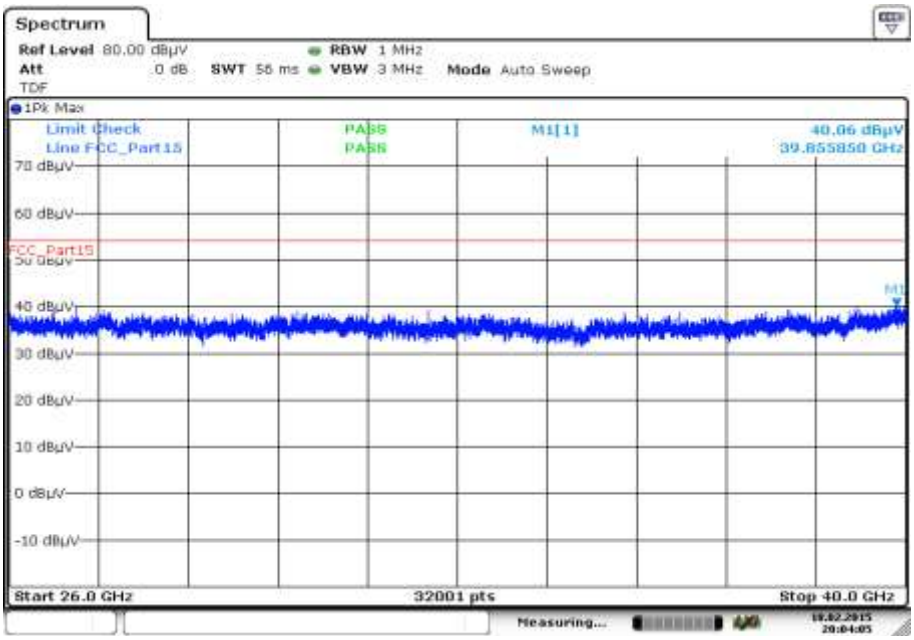
Date: 18.FEB.2015 17:27:11

Plot 3: 18 GHz to 26 GHz, 5745 MHz, vertical & horizontal polarization



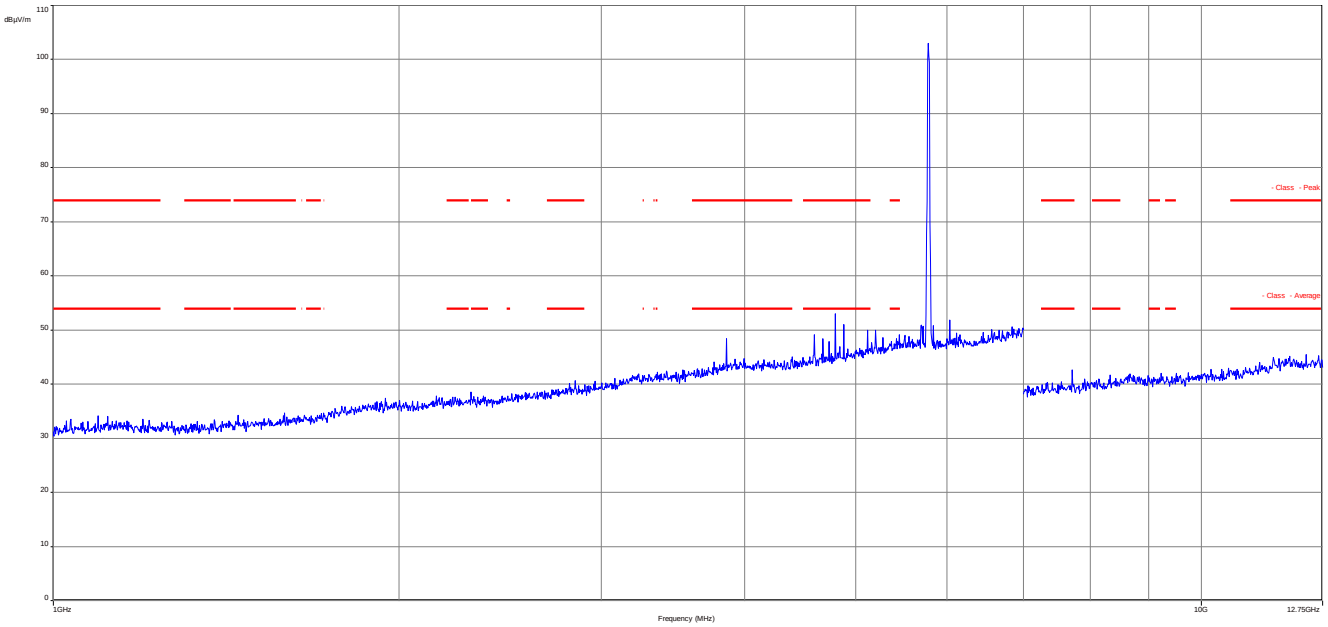
Date: 18.FEB.2015 18:33:38

Plot 4: 26 GHz to 40 GHz, 5745 MHz, vertical & horizontal polarization

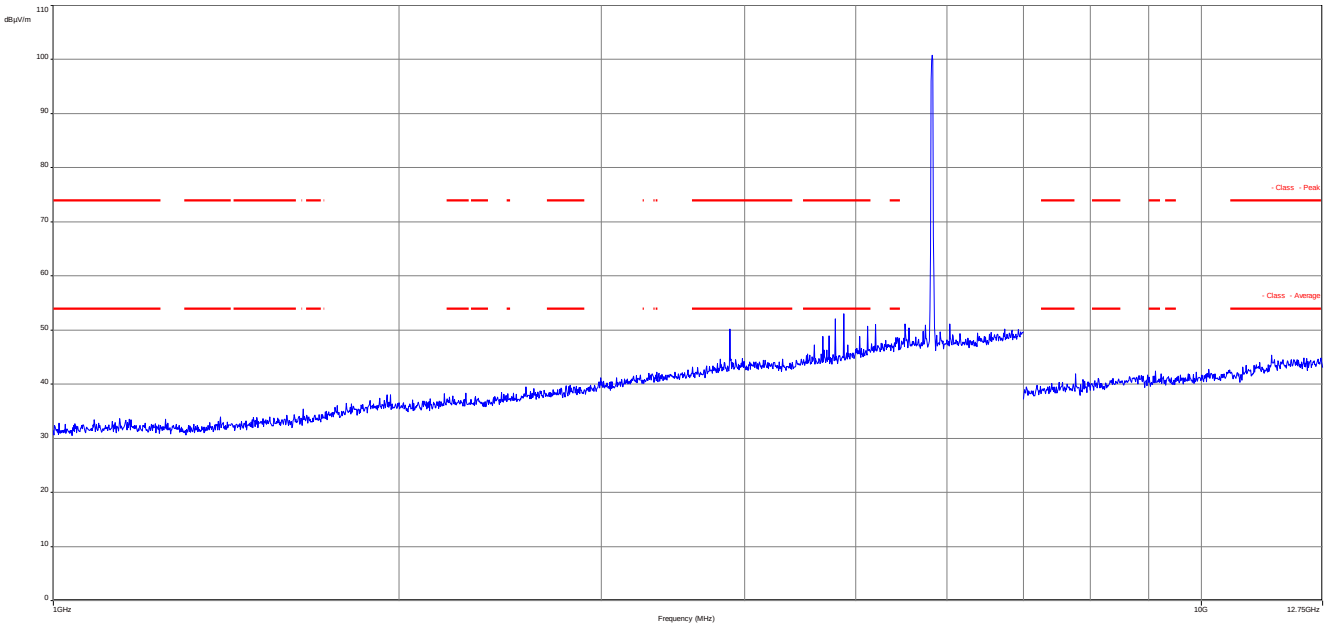


Date: 18.FEB.2015 20:04:04

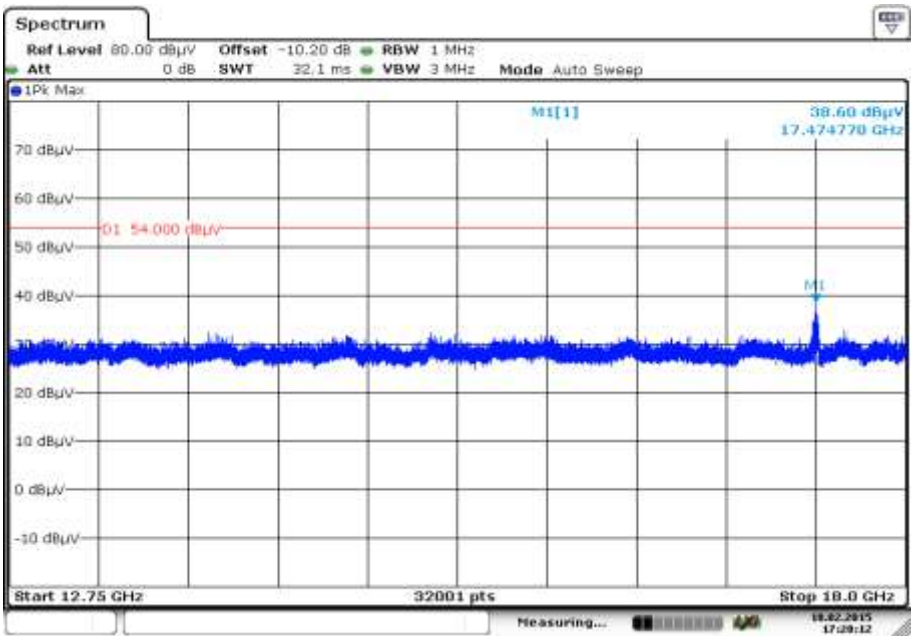
Plot 5: 1 GHz to 12.75 GHz, 5785 MHz, vertical & horizontal polarization



Plot 6: 1 GHz to 12.75 GHz, 5825 MHz, vertical & horizontal polarization

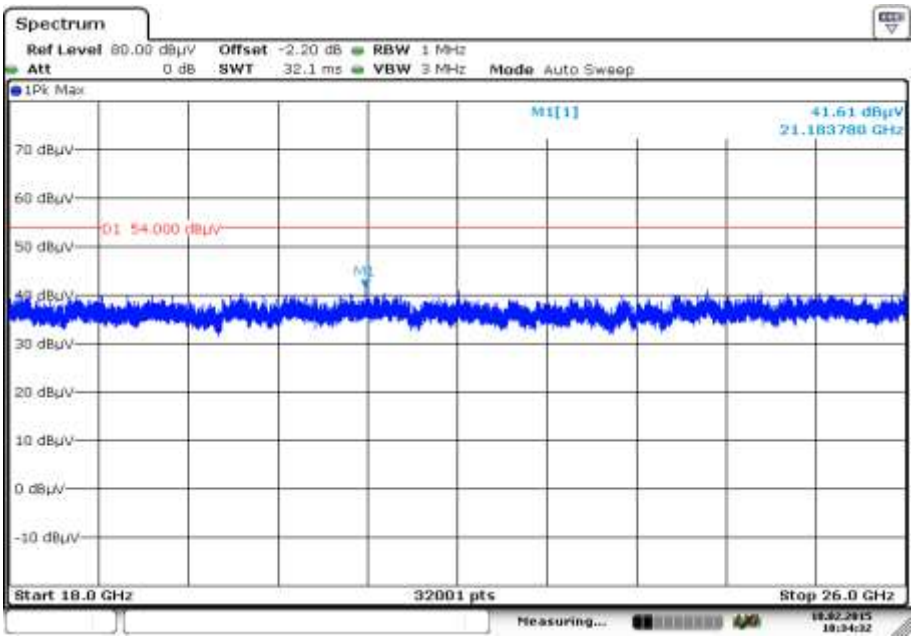


Plot 7: 12 GHz to 18 GHz, 5825 MHz, vertical & horizontal polarization

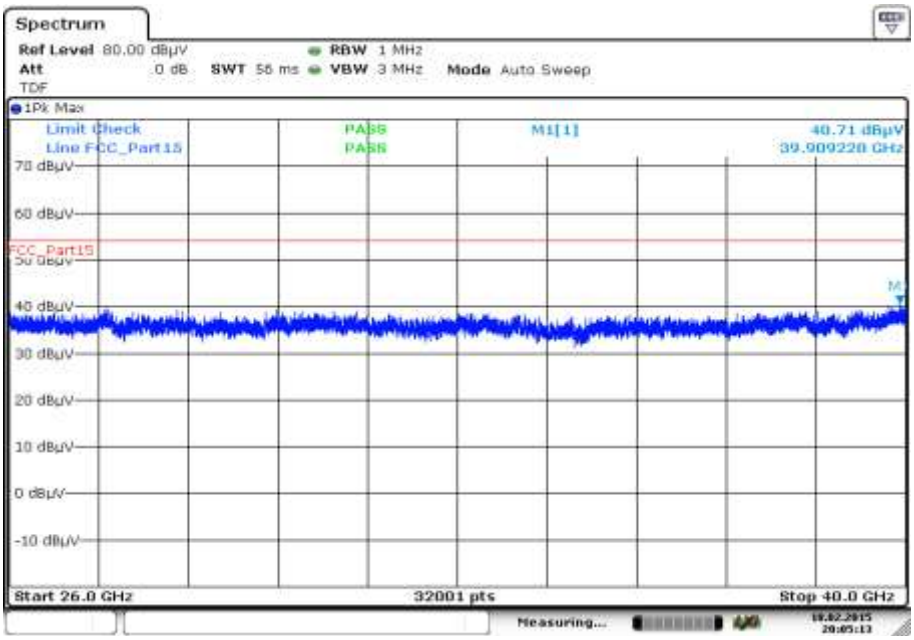


Date: 18.FEB.2015 17:28:12

Plot 8: 18 GHz to 26 GHz, 5825 MHz, vertical & horizontal polarization

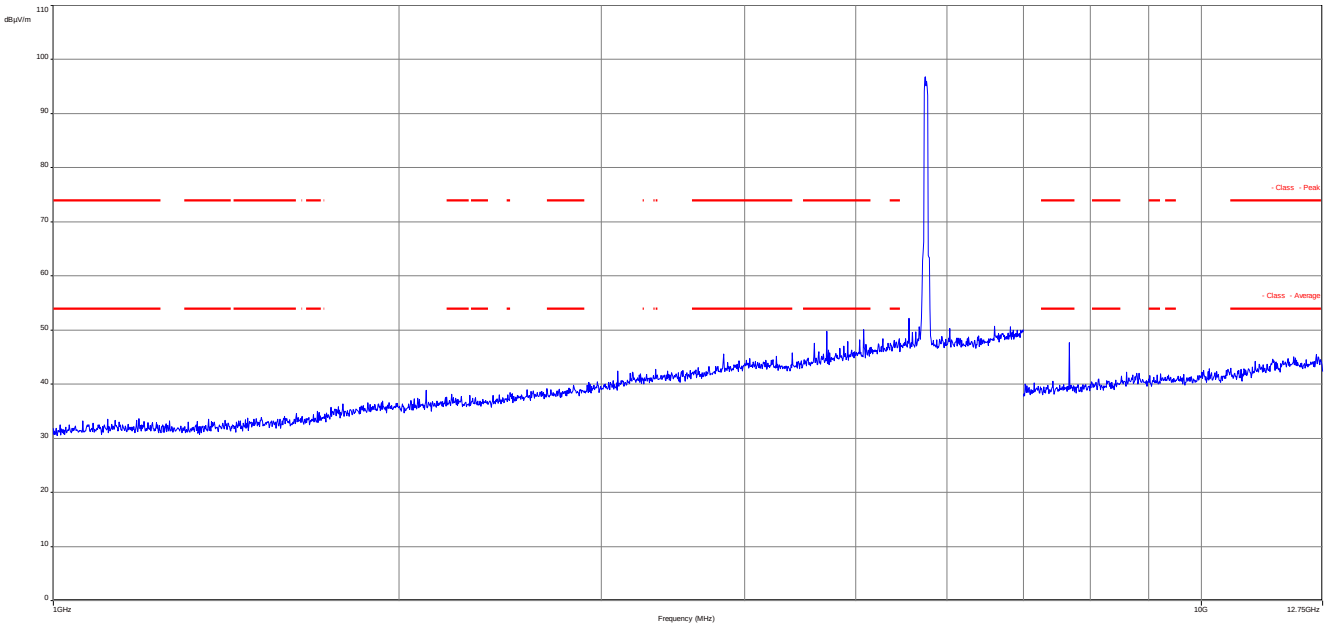


Plot 9: 26 GHz to 40 GHz, 5825 MHz, vertical & horizontal polarization

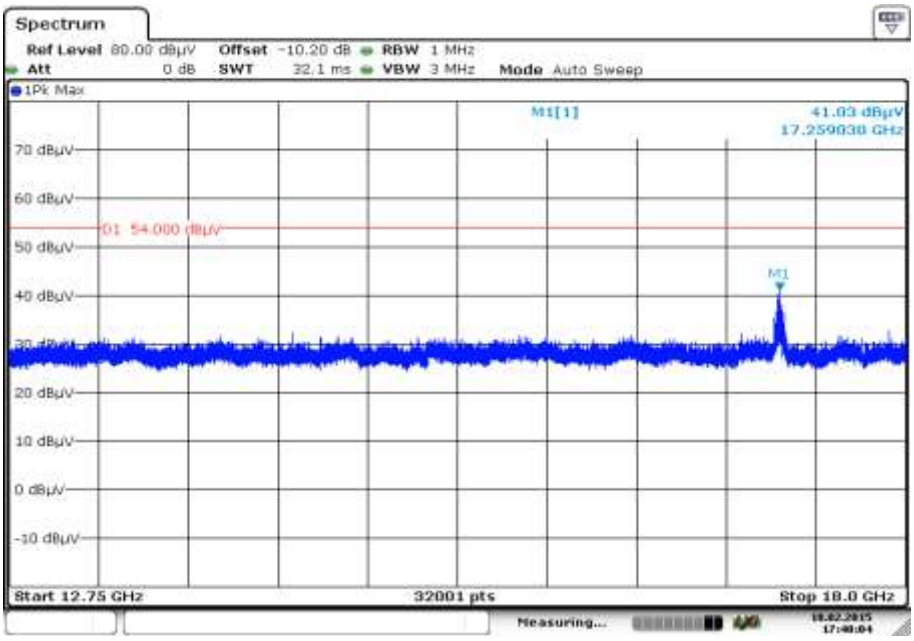


Plots: OFDM / n – mode HT40

Plot 1: 1 GHz to 12.75 GHz, 5755 MHz, vertical & horizontal polarization

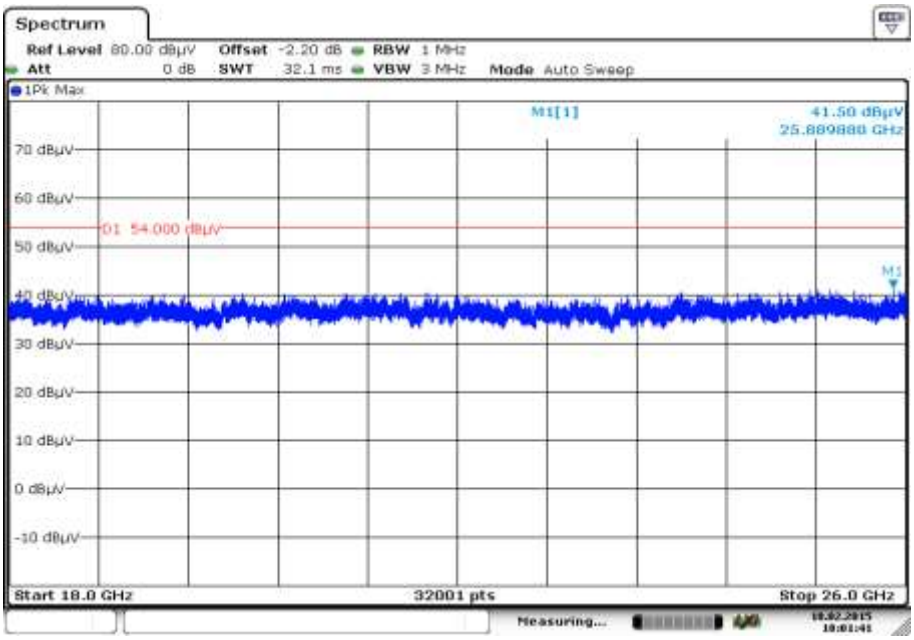


Plot 2: 12 GHz to 18 GHz, 5755 MHz, vertical & horizontal polarization



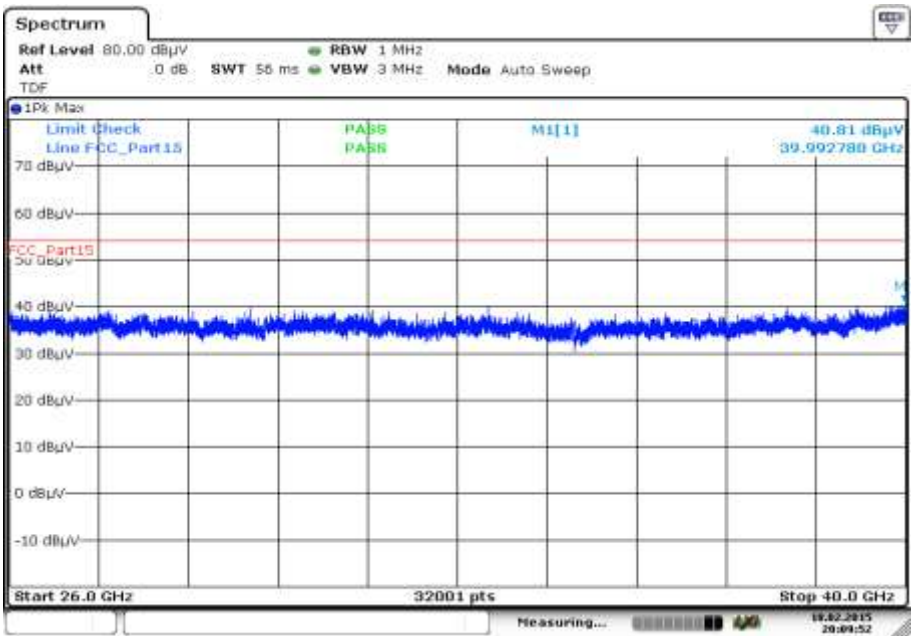
Date: 18.FEB.2015 17:40:04

Plot 3: 18 GHz to 26 GHz, 5755 MHz, vertical & horizontal polarization



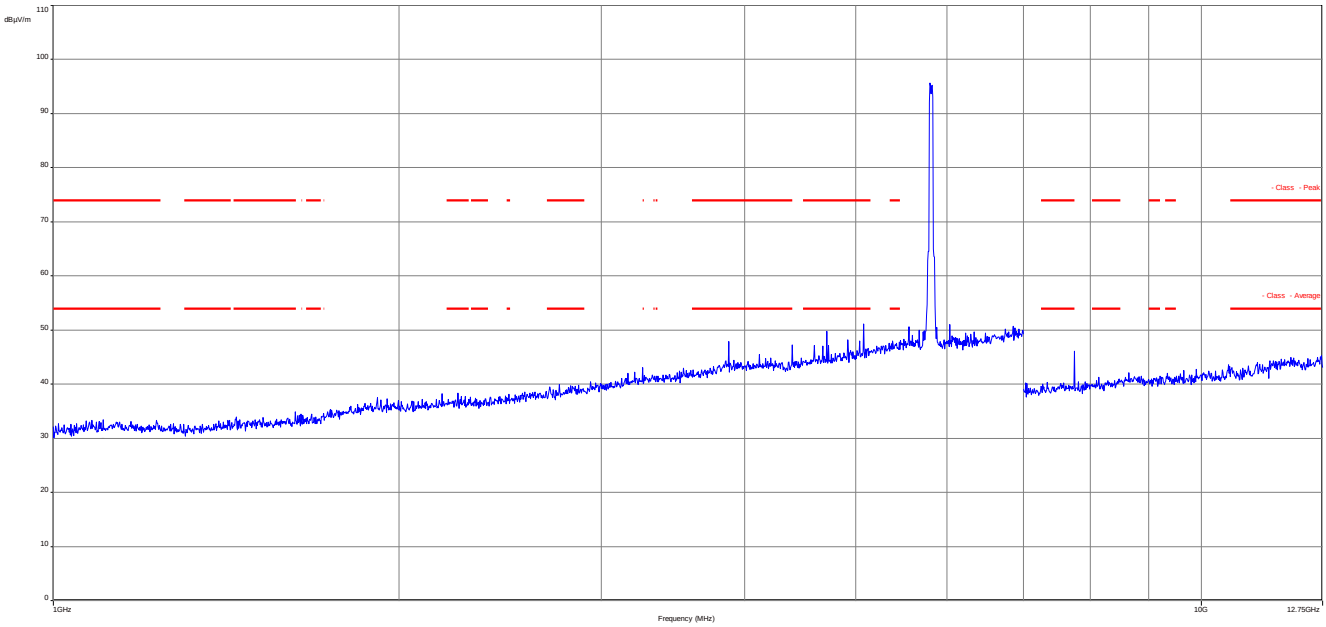
Date: 18.FEB.2015 18:01:41

Plot 4: 26 GHz to 40 GHz, 5755 MHz, vertical & horizontal polarization

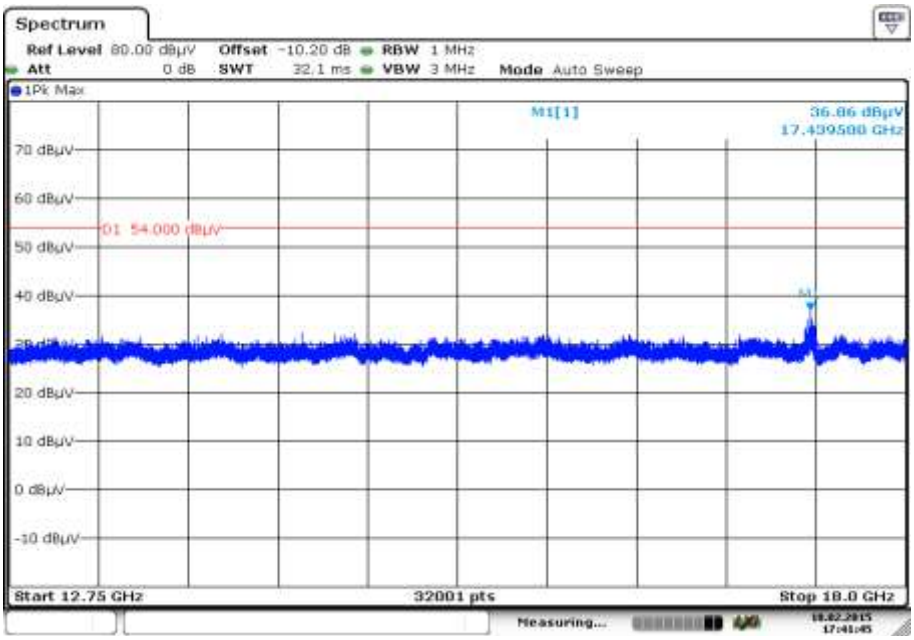


Date: 18.FEB.2015 20:09:52

Plot 5: 1 GHz to 12.75 GHz, 5815 MHz, vertical & horizontal polarization

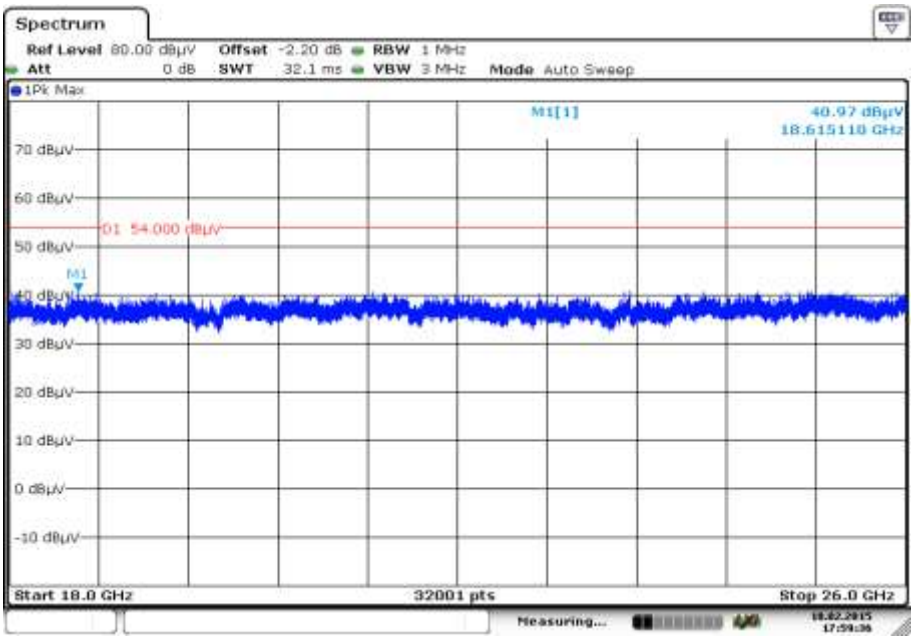


Plot 6: 12 GHz to 18 GHz, 5815 MHz, vertical & horizontal polarization



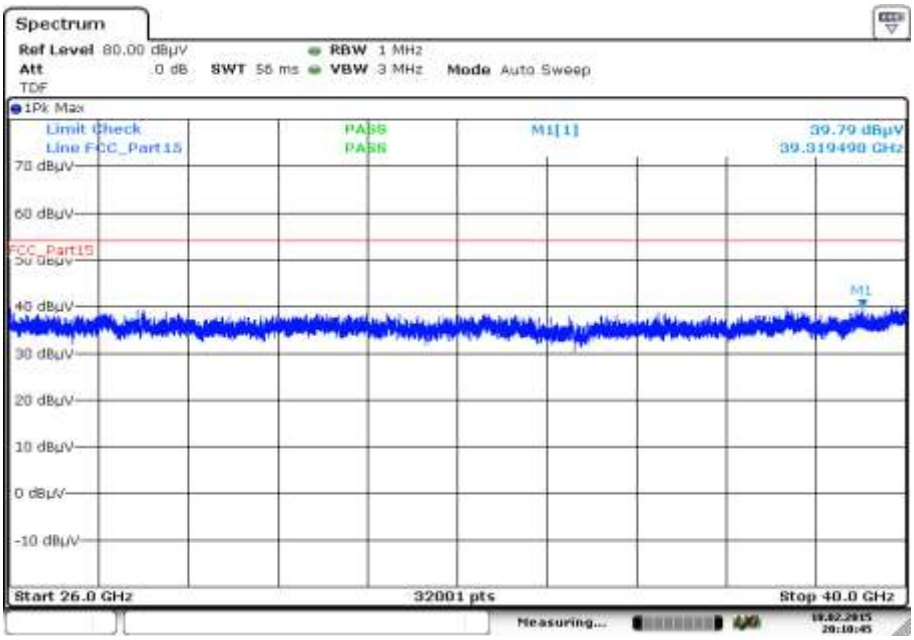
Date: 18.FEB.2015 17:41:45

Plot 7: 18 GHz to 26 GHz, 5815 MHz, vertical & horizontal polarization



Date: 18.FEB.2015 17:59:36

Plot 8: 26 GHz to 40 GHz, 5815 MHz, vertical & horizontal polarization



Date: 18.FEB.2015 20:10:45

12.11 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode.

Measurement:

Measurement parameter	
Detector:	Quasi Peak below 1 GHz (alternative Peak) Peak above 1 GHz / RMS
Sweep time:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: ≥ 3 MHz
Span:	30 MHz to 40 GHz
Trace-Mode:	Max Hold / Average with 100 counts + 20 log (1 / X) for duty cycle lower than 100 %
Used test setup:	see chapter 7.1, 7.2, 7.3
Measurement uncertainty:	see chapter 8

Limits:

RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

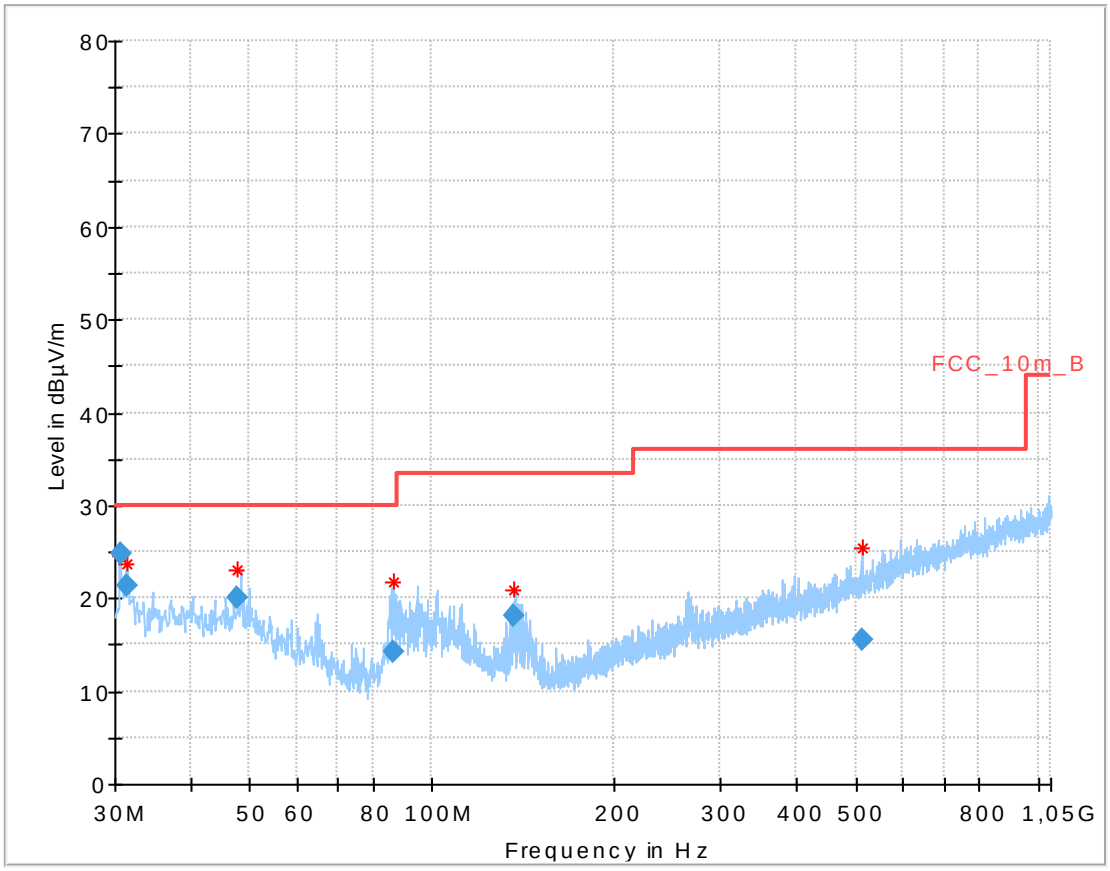
RX Spurious Emissions Radiated [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected peaks are more than 6 dB below the limit.		

Verdict: Complies

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

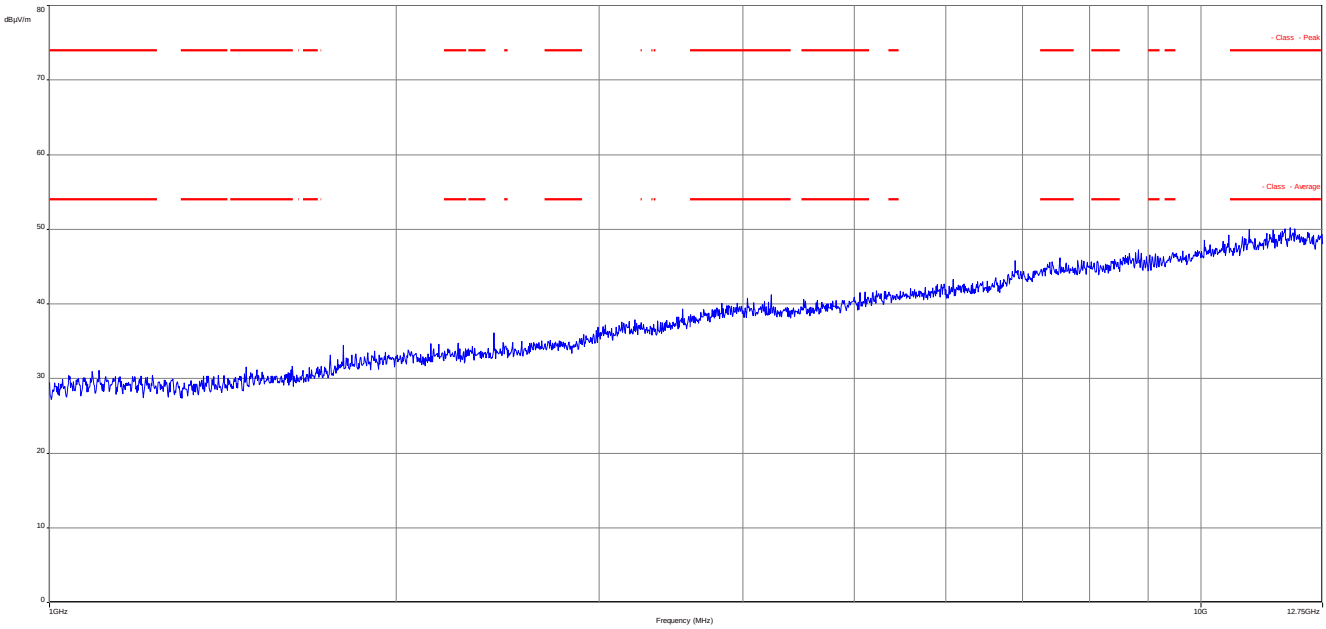
Plots: RX / Idle – mode

Plot 1: 30 MHz to 1 GHz, vertical & horizontal polarization

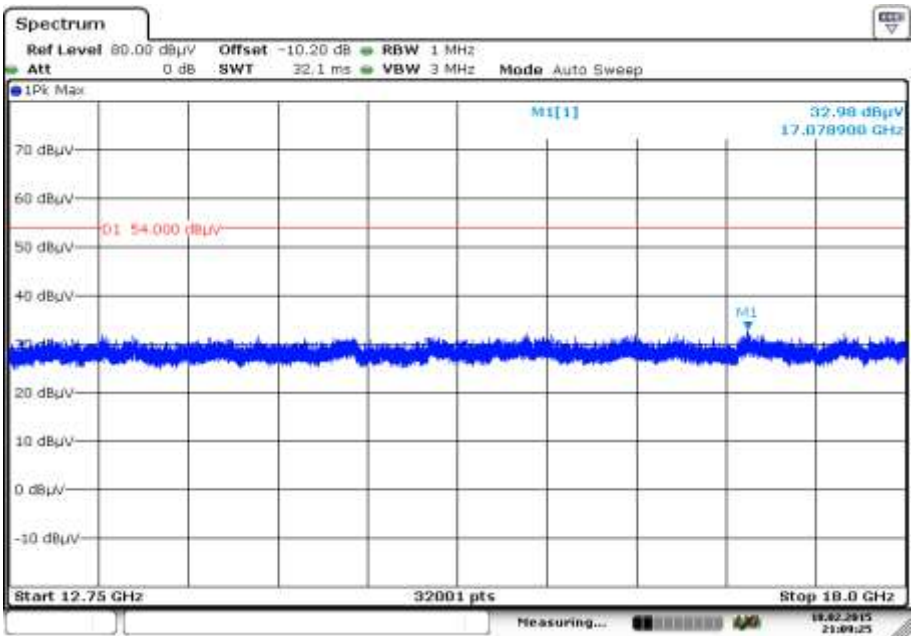


Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.625346	24.80	30.00	5.20	1000.0	120.000	101.0	V	-24	13.4
31.402650	21.40	30.00	8.60	1000.0	120.000	101.0	V	-6	13.5
47.812650	19.97	30.00	10.03	1000.0	120.000	98.0	V	-6	13.2
86.117550	14.22	30.00	15.78	1000.0	120.000	170.0	V	-25	9.6
136.930200	18.12	33.50	15.38	1000.0	120.000	170.0	V	288	8.9
511.473000	15.61	36.00	20.39	1000.0	120.000	170.0	H	25	18.8

Plot 2: 1 GHz to 12.75 GHz, vertical & horizontal polarization

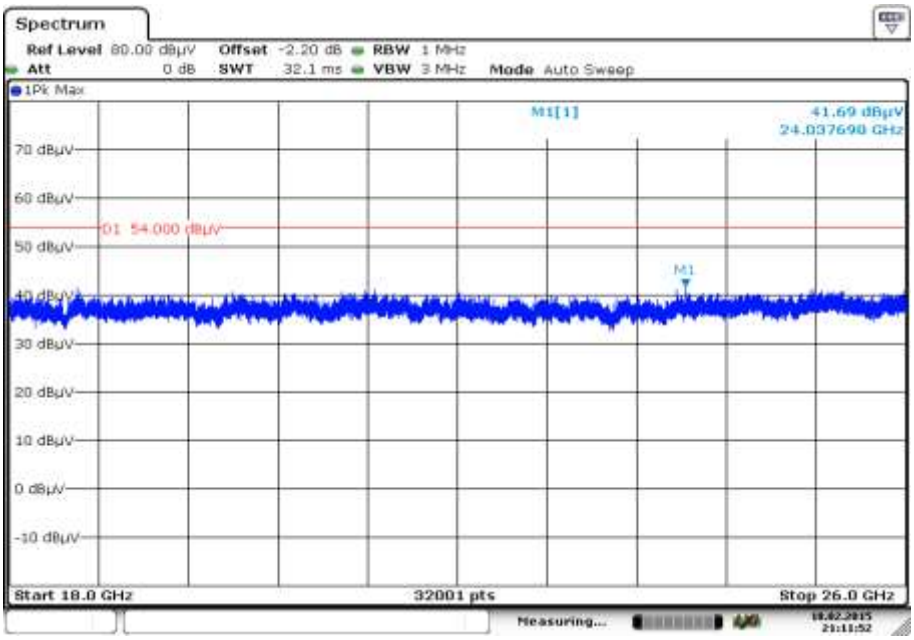


Plot 3: 12 GHz to 18 GHz, vertical & horizontal polarization



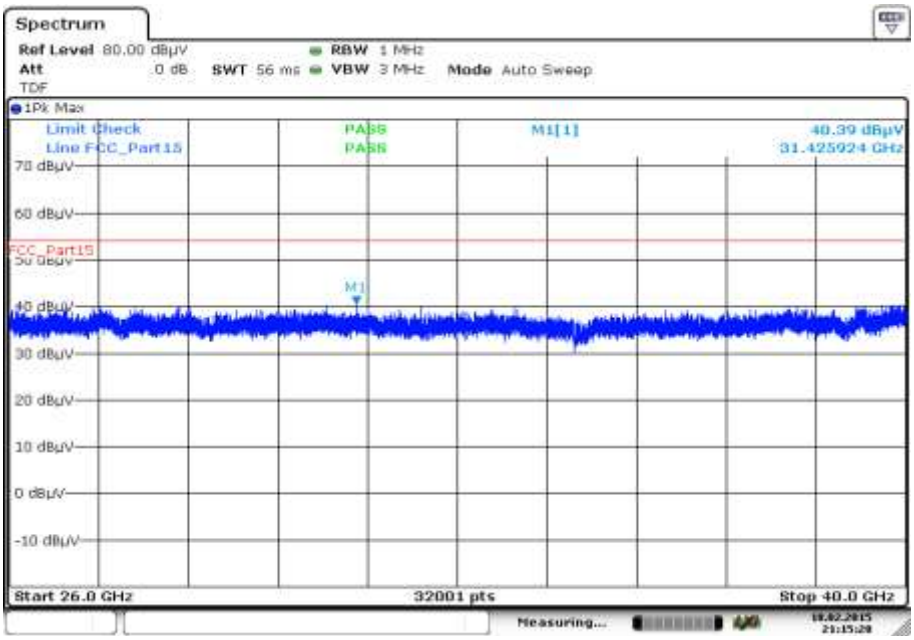
Date: 18.FEB.2015 21:09:26

Plot 4: 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 18.FEB.2015 21:11:53

Plot 5: 26 GHz to 40 GHz, vertical & horizontal polarization



Date: 18.FEB.2015 21:15:28

12.12 Spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode and receive mode below 30 MHz. The EUT is set first to middle channel. This measurement is representative for all channels and modes. If critical peaks are found the lowest channel and the highest channel will be measured too. Then the EUT is set to receive or idle mode. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
According to: KDB789033 D02, G.	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold
Used test setup:	see chapter 7.2
Measurement uncertainty:	see chapter 8

Limits:

Spurious Emissions Radiated < 30 MHz		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Results:

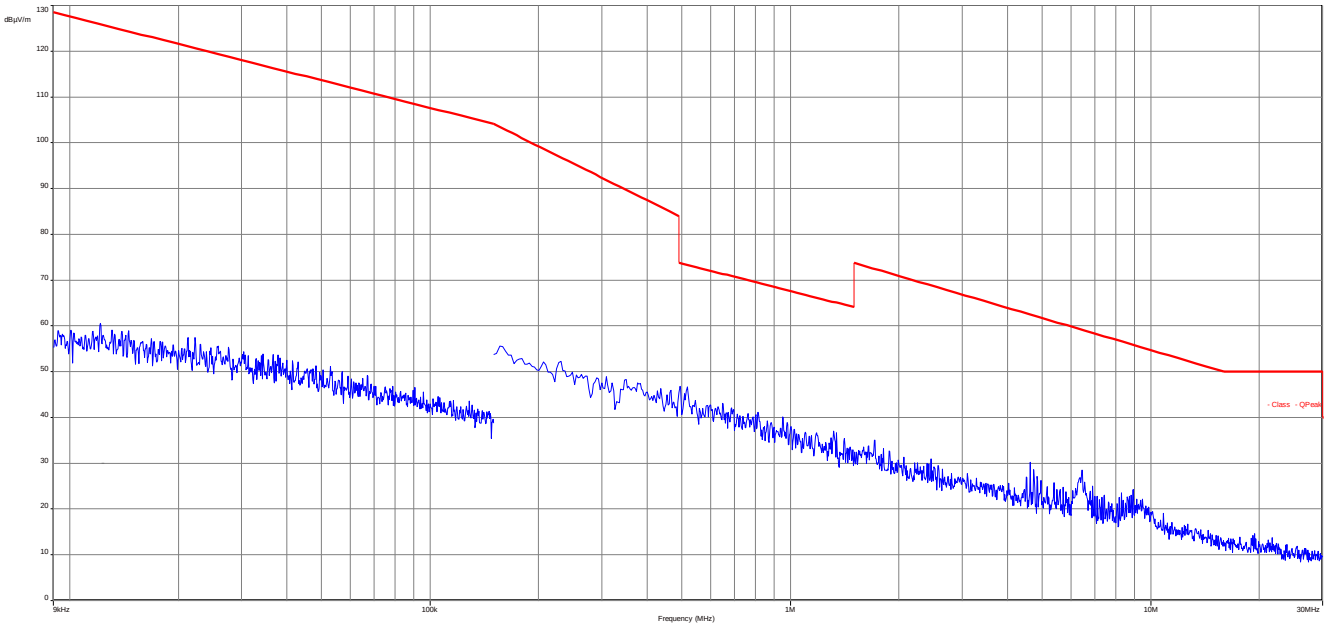
Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected peaks are more than 10 dB below the limit.		

Verdict: Complies

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Plots:

Plot 1: 9 kHz to 30 MHz, TX mode



12.13 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to middle channel. If critical peaks are found the lowest channel and the highest channel will be measured too. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Measurement:

Measurement parameter	
Detector:	Peak - Quasi Peak / Average
Sweep time:	Auto
Video bandwidth:	F > 150 kHz: 9 kHz
Resolution bandwidth:	F > 150 kHz: 100 kHz
Span:	150 kHz to 30 MHz
Trace-Mode:	Max Hold
Used test setup:	see chapter 7.4
Measurement uncertainty:	see chapter 8

Limits:

Spurious Emissions Conducted < 30 MHz		
Frequency (MHz)	Quasi-Peak (dBµV/m)	Average (dBµV/m)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30.0	60	50

*Decreases with the logarithm of the frequency

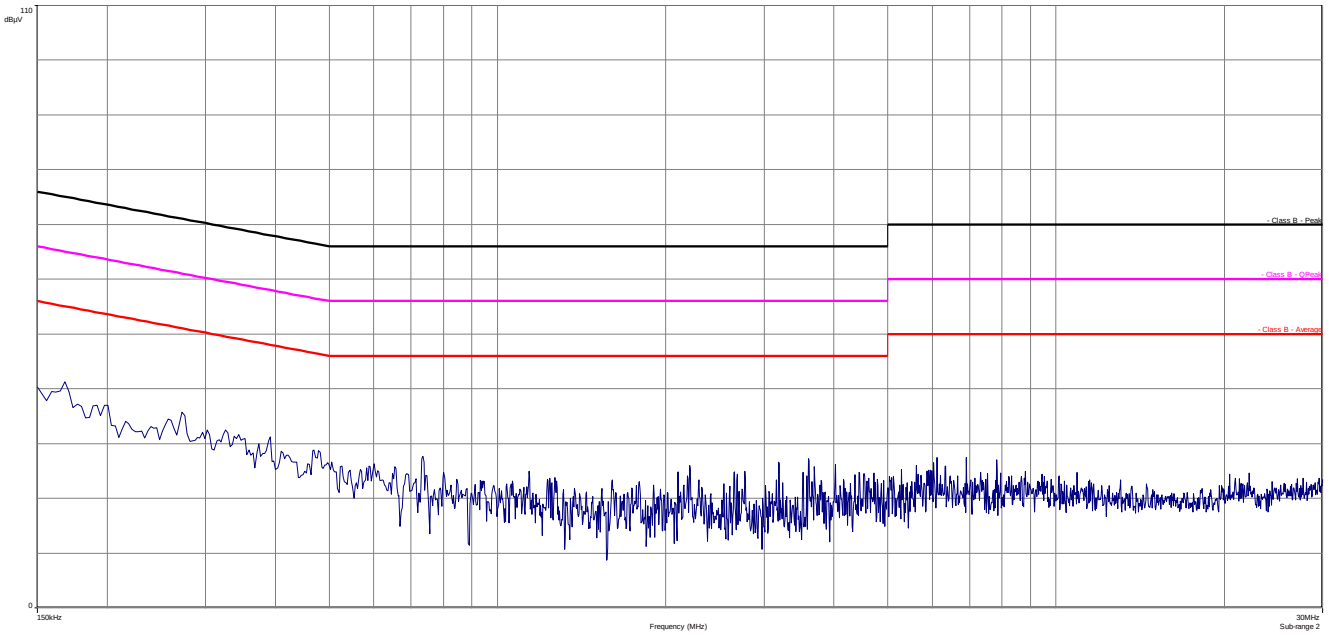
Results:

Spurious Emissions Conducted < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected.		

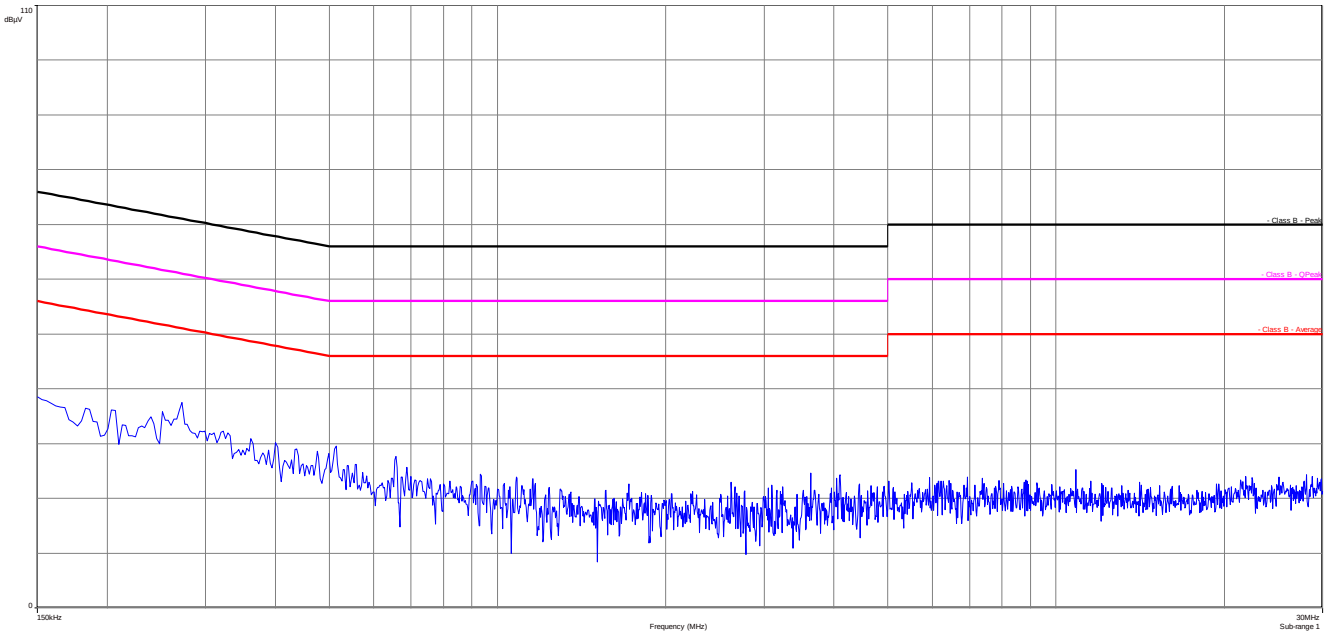
Verdict: Complies

Plots:

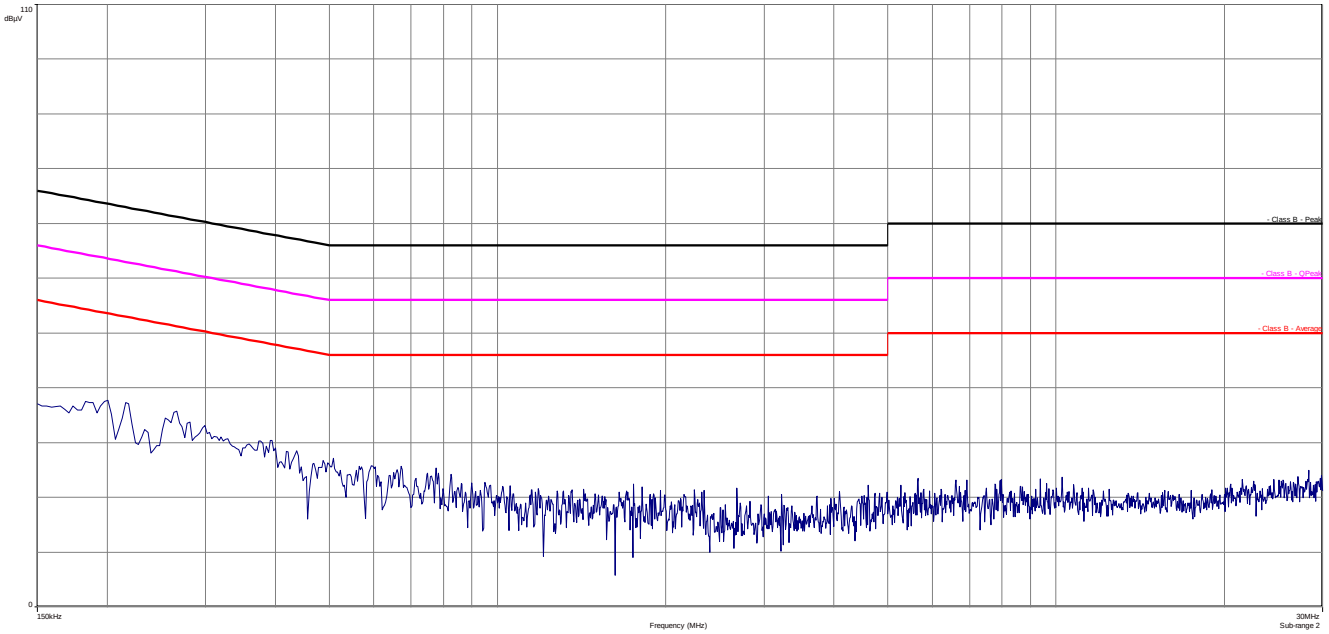
Plot 1: 150 kHz to 30 MHz / phase Line, TX mode



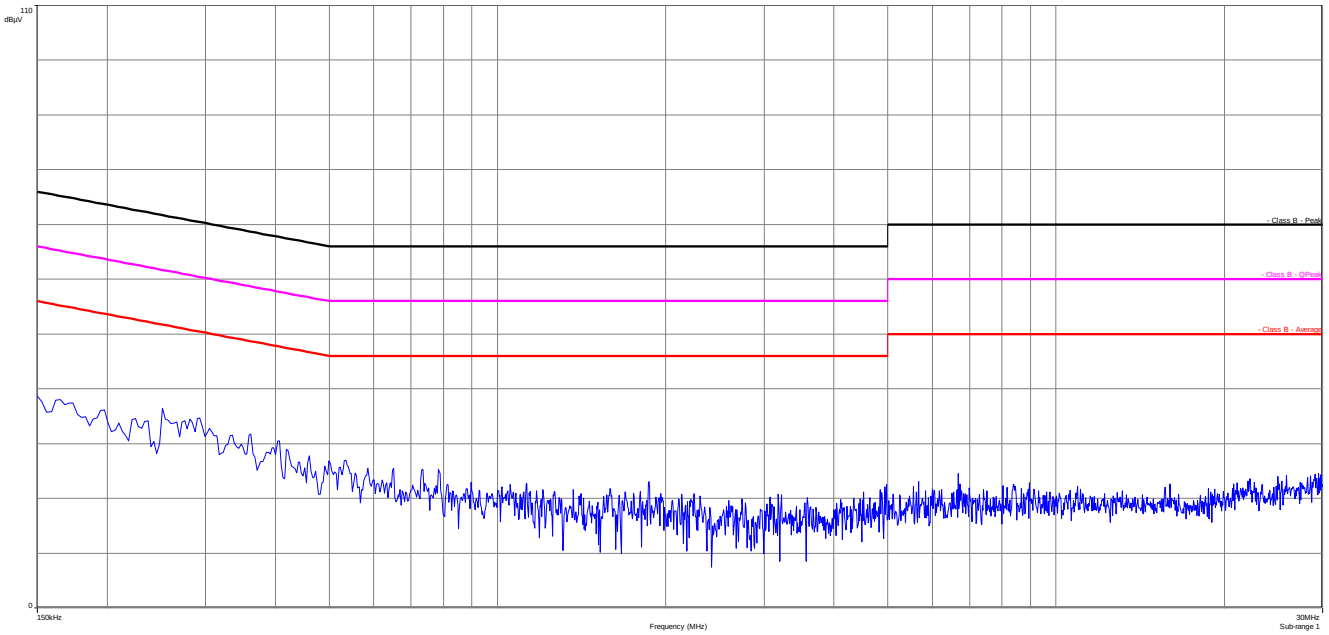
Plot 2: 150 kHz to 30 MHz / neutral Line, TX mode



Plot 3: 150 kHz to 30 MHz / phase Line, RX mode



Plot 4: 150 kHz to 30 MHz / neutral Line, RX mode



13 Observations

No observations except those reported with the single test cases have been made.

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-04-27
A	99% occupied bandwidth results added	2015-06-24
B	Minimum emission bandwidth for the band 5.725-5.85 GHz added. All bands except of 5.8 GHz removed from this report.	2015-07-13
C	Editorial changes	2015-07-27

Annex B Further information

Glossary

AVG - Average
DUT - Device under test
EMC - Electromagnetic Compatibility
EN - European Standard
EUT - Equipment under test
ETSI - European Telecommunications Standard Institute
FCC - Federal Communication Commission
FCC ID - Company Identifier at FCC
HW - Hardware
IC - Industry Canada
Inv. No. - Inventory number
N/A - Not applicable
PP - Positive peak
QP - Quasi peak
S/N - Serial number
SW - Software

Annex C Accreditation Certificate

Front side of certificate

Deutsche Akkreditierungsstelle GmbH

Akkreditierung

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

Drahtgebundene Kommunikation einschließlich xDSL
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Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
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